

# CA FINAL

## RISK MANAGEMENT

### NOV 2020

### PAPER ANALYSIS

**CASE STUDY 3**

**By Sanjay Saraf Sir**

Powered by -

The Risk Management paper of CA Final Nov 2020 Exam was considered to be a challenging paper by most students who appeared for the Exam. It was challenging in the sense that people could not find the answers from the mapping sheet in the ICAI Study Mat. It was challenging in the sense that most of the questions were applicative wherein:

- you know where the Risk Register topic is in the study mat, but you have to write something else
- you know where RCSA is in study mat, but you have to write about the **application** of RCSA in that particular case study
- you know what is strategic risk—you can pretty much find it in the study mat, but you have to talk about the **key drivers** of strategic risk.

So, it was applicative-applicative-applicative all through out. Even the MCQs were more-or-less related to the case study and not to be found from the institute's mat. All case studies required use of the exam taker's brain & judgement rather than just reproducing content from the mat. My question to you is--- isn't that what case studies actually mean and should be like???

So, people were obviously surprised because they could not find the arbitrage opportunity that was there in the previous RM papers to date.

Was it different for other elective papers?

No, even the other elective paper have the same status. But RM is in the limelight more because most people are doing RM these days and they have heard stories of people enjoying arbitrage in the past. As students of the RM paper, you will understand and acknowledge that markets are efficient and arbitrage itself leads to wiping out of the available opportunity. You, as budding CA's with RM as your elective (or specialization) have to now upgrade your levels. You got to understand that ICAI's study mat and mapping-sheet are now matters of the past and just a hoax now forth. These wouldn't help you on standalone basis now—that's guaranteed. What's required of you now is that whatever topic you are doing-- along with in-depth knowledge of it, you got to keep an open mind about its concept—use your brain, general understanding & common sense involved in the topic--- be it regarding Risk Based Internal Audit, be it risk and control matrix (RCM), risk management strategies, reputation risk, governance risk, enterprise risk management, risk maturity of an organization or any other concept.

So this paper is causing a sea- change in the way in which Risk Management paper shall be set in future.

I have carried out a deep analysis of each & every Case Study-- provided multiple answers wherever there was a scope of ambiguity. It's a subjective paper and the answers are based on my judgement and are not provided by ICAI. As always, confusion arises (and will arise) when ICAI comes out with their suggested answers.

When they do, please look at them in detail and remember that ICAI's answers are supposed to be given more importance (even if it defies logic) than the answers that I have reproduced below.

**Note:**

- ✓ **For Jan 21 exam, I will be sharing a number of insights in the coming days.**
- ✓ **Also, I have already announced fresh batches in both English and Hindi for RM to begin from 4th Jan Live at Home on the Ulearn Portal. These are obviously for the May 21 exams and beyond.**

- Sanjay Sir

STAY TUNED ON SSEI QFORUM  
FOR ANALYSIS OF CASE  
STUDIES 4 & 5

# CA FINAL RISK MANAGEMENT

## NOV 20 PAPER ANALYSIS

---

### Case Study 3 : STEPOIL

#### Synopsis:

- StepOil, Mumbai is a top10 O&G producer with Rs700billion revenue and 23000 Ees in 2020.
- Known for operational excellence, leader in offshore oil production
- Sold its downstream and petro business in past years—now heavily focussed in upstream activities (major Indian ops, international forms smaller part)
- Trading portfolio managed by qualified PM
- 4 more focus areas—mkting, tech, exploration and strategy
- ERM introduced in 2014 to manage the complex business structure of Stepoil headed by Mr Aman, who will systemize risk mgt in finance dept—managed as a portfolio of risks with central oversight.
- CEO wants to now apply this to whole company and manage risks in integrated manner.
- 2016—Risk Committee formed with Head of Strategy, Treasury, Chief Controller, Internal Control and CRO—so that all professionals can put proposals and recomm, analysis etc.
- CRO yet to get authority and autonomy—resistance from CEO
- Internal Audit team not cooperating with ERM implementation—worried about reduced authority
- Majority ppl (including senior execs) feel that ERM is an administrative burden with nothing in it for them



- Mr Aman and CRO demonstrate (by finance dept txns) how silo thinking makes less sense and ERM is instrumental.
- 2018—Risk Dept formally set up with CRO heading it—to develop a consolidated risk model.
- CRO proposes using VAR technique to quantify risk for easier understanding—Board members apprehensive about using a mechanical process like VAR.
- CROs focus is to convince Board about developing a ERM approach with a value-creation principle and which is thoroughly embedded at business unit level.
- Board wants to understand Risk culture—CRO appoints Independent Consultant for assessment.
- BCP currently managed by Cyber sec team (separate from ERM) as they believe BCP and ERM are not linked.

### **Nutshell:**

Complex business structure with varied functional areas. Senior Execs n Board resistant to change/ fail to support Risk Officer in integrating various risk functions...fixated on Silo thinking.

ERM introduced, but with resistance from various pockets and hence less effective as its not integrated well into company fabric.

## MULTIPLE CHOICE QUESTIONS

### 3.1. Option A. It is a Unified Method of Measuring Risk

The statement is correct. VaR is a unified method of measuring risk because all risk can be aggregated using VaR.

### Option B. VaR does not measure liquidity risk.

The statement is correct. If you are having some positions, you may not be able to sell it at normal prices if there is liquidity crisis but VaR does not capture the same.

### **Option C. VaR does not measure operational risk.**

*The statement is incorrect because we do calculate operational VaR. In fact if the statement were to be correct, then option A is also wrong because option A is unified method of measuring risk - how will you unify or aggregate risk if VaR cannot capture operational risk.*

### Option D. VaR is not Risk Management.

This is very bad language first of all, I think. Whoever design this language is totally insane. They mean to say, VaR is a tool which is designed to measure risk -it is part of risk management but VaR itself is not risk management. So, that way, the statement is correct.

### **So, which is the correct answer ?**

*Option C because the question was which of the following is incorrect with respect of VaR. So, statement C is incorrect.*

### **Sanjay Sir's Comment :**

*It is but obvious that ICAI will give at least 1 case study focusing on chapter 5. Students who have not done RM classes from me will face a tremendous problem in understanding even the A B C of chapter 4. In fact, a YouTuber pointed out that the answer is Option D. This means according to that person, VaR is risk management. Also, according to that person, VaR does not measure Operational Risk – if that were true, what is BASEL II and it's subsequent development all about? – why do we have Operational Risk Chapter in the Curriculum? Also, then how can VaR be a unified measure of Risk as in Option A?*

***Average Performance would be Poor.***

**3.2. Option A. ERM is the process of effected by entity's Board of Directors, Management and other personnel**

The statement is correct. Obviously ERM is holistic - it is integrated and therefore, it is has to be affected by everybody from top to bottom - everybody has participate in its implementation and making it effective.

**Option B. It is applied in strategic setting and across the enterprise.**

This statement is correct. The whole approach of ERM is strategic as it aims to enable an organization to create, preserve and realize value for stakeholders.

**Option C. It is manages risk to be within the risk appetite.**

The statement is correct. This is the very basic of ERM. You have to ensure that assessed risk stays within Risk Appetite.

***Option D. It provides complete assurance regarding the achievement of entities objective.***

*The statement is incorrect. ERM provides reasonable assurance and not complete insurance. In fact, there is no Risk Management approach that can provide complete assurance.*

**Sanjay Sir's Comment :**

*This is a straight forward MCQ framed from Page 8.3 of ICAI Study Mat and could have been spotted from Mapping Sheet.*

***Average performance would have been good.***

**3.3. Option A. The model calculates potential losses using actual historical returns in the risk factors and so captures the normal distribution of risk factor returns.**

*The statement is incorrect.*

Calculation of 95% VaR using Historical Simulation method	
Stock	<b>Reliance Industries Ltd.</b>
Date	12/14/2020
Quantity	1000
Price	1,993.55
Portfolio Value	<b>1993550</b>
95% VaR	<b>-61041.76303</b>

Date	Price	Returns	Portfolio Gain/Losses	Worst to best
Dec 14, 2020	1,993.55	-0.611%	-12175.18571	-262224.4092
Dec 11, 2020	2,005.80	-0.060%	-1191.958146	-246021.11
Dec 10, 2020	2,007.00	-0.984%	-19621.26471	-171797.531
Dec 09, 2020	2,026.95	1.665%	33196.66959	-161607.6955
Dec 08, 2020	1,993.75	1.815%	36191.75901	-156487.5341
Dec 07, 2020	1,958.20	0.588%	11725.25876	-123327.7655
Dec 04, 2020	1,946.75	-0.881%	-17559.84573	-104580.2853
Dec 03, 2020	1,964.05	0.301%	6006.6619	-83536.77892
Dec 02, 2020	1,958.15	0.166%	3314.255205	-82835.33203
Dec 01, 2020	1,954.90	1.301%	25929.16623	-80597.26352
Nov 27, 2020	1,929.80	-1.168%	-23278.16245	-79202.3485
Nov 26, 2020	1,952.60	0.246%	4912.742581	-78102.48666
Nov 25, 2020	1,947.80	-0.827%	-16494.07474	-76571.91559
Nov 24, 2020	1,964.05	0.684%	13643.25242	-75915.04956
Nov 23, 2020	1,950.70	2.695%	53735.06712	-74411.4525
Nov 20, 2020	1,899.50	-3.733%	-74411.4525	-74196.27474
Nov 19, 2020	1,973.15	-0.707%	-14094.89608	-70591.27869
Nov 18, 2020	1,987.20	-0.304%	-6050.910573	-69021.42035
Nov 17, 2020	1,993.25	-0.158%	-3145.503156	-67309.69333
Nov 13, 2020	1,996.40	0.828%	16512.23232	-65974.1542
Nov 12, 2020	1,980.00	-0.861%	-17168.56599	-65883.03834
Nov 11, 2020	1,997.20	-4.190%	-83536.77892	-65759.82247
Nov 10, 2020	2,084.55	1.651%	32906.65017	-65354.19159
Nov 09, 2020	2,050.70	1.062%	21171.92051	-61340.97915
Nov 06, 2020	2,029.15	3.793%	75612.13939	-61041.76303
Nov 05, 2020	1,955.00	2.185%	43555.50387	-59610.08846
Nov 04, 2020	1,913.20	3.394%	67658.31172	-59607.42109

Nov 03, 2020	1,850.40	-1.441%	-28722.75027	-58400.6446
Nov 02, 2020	1,877.45	-8.618%	-171797.531	-56032.72943
Oct 30, 2020	2,054.50	1.362%	27145.87794	-55012.22894
Oct 29, 2020	2,026.90	0.768%	15312.50963	-53337.29141
Oct 28, 2020	2,011.45	-1.133%	-22586.05431	-50329.92453
Oct 27, 2020	2,034.50	0.266%	5305.391553	-49898.93903
Oct 26, 2020	2,029.10	-3.973%	-79202.3485	-49473.96881
Oct 23, 2020	2,113.05	0.290%	5771.686561	-48839.0707
Oct 22, 2020	2,106.95	-0.831%	-16561.30919	-48630.13609
Oct 21, 2020	2,124.60	-1.452%	-28942.95422	-46241.05942
Oct 20, 2020	2,155.90	-0.933%	-18596.20669	-46045.07404
Oct 19, 2020	2,176.20	0.018%	366.4950823	-44326.20141
Oct 16, 2020	2,175.80	-1.391%	-27737.13347	-44324.94172
Oct 15, 2020	2,206.50	-3.541%	-70591.27869	-44070.49627
Oct 14, 2020	2,287.50	0.298%	5943.850572	-44064.46859
Oct 13, 2020	2,280.70	1.951%	38898.75394	-43698.01248
Oct 12, 2020	2,237.05	0.161%	3213.315722	-43683.99803
Oct 09, 2020	2,233.45	-0.259%	-5163.599419	-43101.2133
Oct 08, 2020	2,239.25	-0.808%	-16116.18494	-42481.15769
Oct 07, 2020	2,257.50	2.133%	42525.33875	-41882.62913
Oct 06, 2020	2,210.35	-0.084%	-1667.149218	-41090.37432
Oct 05, 2020	2,212.20	-0.586%	-11691.19312	-40921.14318
Oct 01, 2020	2,225.25	-0.407%	-8119.2763	-40028.98174
Sep 30, 2020	2,234.35	-0.477%	-9501.340727	-39959.67255
Sep 29, 2020	2,245.05	1.299%	25906.03046	-39502.48687
Sep 28, 2020	2,216.25	0.661%	13174.43453	-39467.34595
Sep 25, 2020	2,201.70	0.940%	18736.37218	-39386.88119
Sep 24, 2020	2,181.20	-2.223%	-44324.94172	-39079.17994
Sep 23, 2020	2,230.80	0.889%	17716.23703	-39005.50472
Sep 22, 2020	2,211.15	-1.982%	-39502.48687	-38927.46192
Sep 21, 2020	2,255.85	-2.162%	-43101.2133	-38850.10468
Sep 18, 2020	2,305.70	0.302%	6027.26373	-38147.88734
Sep 17, 2020	2,298.75	-1.110%	-22126.25669	-37970.26973
Sep 16, 2020	2,324.55	0.246%	4900.375186	-36777.51204
Sep 15, 2020	2,318.85	0.708%	14112.55564	-36297.98239
Sep 14, 2020	2,302.55	-0.741%	-14781.36006	-35837.32785
Sep 11, 2020	2,319.75	0.248%	4953.72191	-34807.37492
Sep 10, 2020	2,314.00	7.063%	140798.7635	-34532.98571
Sep 09, 2020	2,161.35	2.575%	51326.50918	-34341.17561
Sep 08, 2020	2,107.10	1.174%	23403.97931	-34010.65373
Sep 07, 2020	2,082.65	0.260%	5182.41425	-33882.43648
Sep 04, 2020	2,077.25	-1.650%	-32893.90535	-33406.86896
Sep 03, 2020	2,112.10	-0.757%	-15081.36218	-33396.19001



Sep 02, 2020	2,128.20	1.962%	39111.68883	-33075.64399
Sep 01, 2020	2,087.25	0.315%	6275.653626	-33020.83359
Aug 31, 2020	2,080.70	-1.675%	-33396.19001	-32947.06265
Aug 28, 2020	2,116.15	0.263%	5242.207192	-32893.90535
Aug 27, 2020	2,110.60	-1.249%	-24904.21794	-32266.41411
Aug 26, 2020	2,137.30	2.651%	52852.38941	-32121.22419
Aug 25, 2020	2,082.10	-0.651%	-12984.35286	-32051.903
Aug 24, 2020	2,095.75	0.668%	13310.44264	-31645.48033
Aug 21, 2020	2,081.85	-0.725%	-14449.8033	-31100.89344
Aug 20, 2020	2,097.05	-1.619%	-32266.41411	-30805.1681
Aug 19, 2020	2,131.55	0.614%	12232.96594	-30653.14198
Aug 18, 2020	2,118.55	1.301%	25928.01779	-30639.78325
Aug 17, 2020	2,091.35	-1.062%	-21172.86285	-30520.11151
Aug 14, 2020	2,113.80	-0.389%	-7750.424118	-30432.43989
Aug 13, 2020	2,122.05	-0.261%	-5200.320784	-30211.58635
Aug 12, 2020	2,127.60	-0.291%	-5792.487581	-29566.85391
Aug 11, 2020	2,133.80	0.658%	13118.86336	-29566.0299
Aug 10, 2020	2,119.85	-1.239%	-24705.17832	-28942.95422
Aug 07, 2020	2,146.45	0.579%	11536.63957	-28827.49907
Aug 06, 2020	2,134.10	0.360%	7171.886242	-28722.75027
Aug 05, 2020	2,126.45	-1.123%	-22386.41891	-28662.77604
Aug 04, 2020	2,150.60	7.048%	140511.0403	-27824.09581
Aug 03, 2020	2,009.00	-2.811%	-56032.72943	-27737.13347
Jul 31, 2020	2,067.10	-1.980%	-39467.34595	-26643.78969
Jul 30, 2020	2,108.85	0.582%	11600.08108	-26506.79527
Jul 29, 2020	2,096.65	-3.722%	-74196.27474	-26326.55351
Jul 28, 2020	2,177.70	0.997%	19878.17689	-26243.89697
Jul 27, 2020	2,156.20	0.468%	9335.404096	-26226.05751
Jul 24, 2020	2,146.15	4.293%	85591.47755	-25959.03806
Jul 23, 2020	2,057.80	2.685%	53519.45609	-25707.74329
Jul 22, 2020	2,004.00	1.646%	32812.10089	-25673.30452
Jul 21, 2020	1,971.55	2.690%	53631.36491	-25476.02268
Jul 20, 2020	1,919.90	0.429%	8551.085421	-24904.21794
Jul 17, 2020	1,911.70	3.705%	73863.22285	-24727.44335
Jul 16, 2020	1,843.40	-0.033%	-648.6605206	-24705.17832
Jul 15, 2020	1,844.00	-3.808%	-75915.04956	-24618.50068
Jul 14, 2020	1,917.00	-0.930%	-18544.65116	-24591.74278
Jul 13, 2020	1,935.00	3.032%	60452.42273	-24534.66308
Jul 10, 2020	1,878.05	2.949%	58792.92312	-24419.3969
Jul 09, 2020	1,824.25	1.460%	29104.94299	-24153.99229
Jul 08, 2020	1,798.00	-1.396%	-27824.09581	-24081.68997
Jul 07, 2020	1,823.45	-1.531%	-30520.11151	-23660.09076
Jul 06, 2020	1,851.80	3.574%	71249.98322	-23278.16245

Jul 03, 2020	1,787.90	1.565%	31199.64922	-23257.19565
Jul 02, 2020	1,760.35	1.309%	26101.0949	-23042.86641
Jul 01, 2020	1,737.60	1.966%	39190.14436	-22612.49732
Jun 30, 2020	1,704.10	-1.106%	-22039.3625	-22586.05431
Jun 29, 2020	1,723.15	-1.062%	-21175.70982	-22386.41891
Jun 26, 2020	1,741.65	1.383%	27560.86646	-22126.25669
Jun 25, 2020	1,717.90	-0.576%	-11480.06048	-22039.3625
Jun 24, 2020	1,727.85	0.404%	8051.120053	-21890.52135
Jun 23, 2020	1,720.90	-1.446%	-28827.49907	-21175.70982
Jun 22, 2020	1,746.15	-0.753%	-15013.37814	-21172.86285
Jun 19, 2020	1,759.40	6.250%	124604.3994	-20794.95732
Jun 18, 2020	1,655.90	2.510%	50043.92392	-20532.53265
Jun 17, 2020	1,615.35	-0.145%	-2895.989677	-20302.3132
Jun 16, 2020	1,617.70	0.195%	3889.43204	-20029.33607
Jun 15, 2020	1,614.55	1.621%	32309.86436	-19878.21916
Jun 12, 2020	1,588.80	3.323%	66248.55629	-19654.30848
Jun 11, 2020	1,537.70	-2.191%	-43683.99803	-19621.26471
Jun 10, 2020	1,572.15	2.277%	45391.95915	-19619.22192
Jun 09, 2020	1,537.15	-2.061%	-41090.37432	-19498.97766
Jun 08, 2020	1,569.50	-0.771%	-15376.68964	-18751.49031
Jun 05, 2020	1,581.70	0.120%	2397.610457	-18709.09886
Jun 04, 2020	1,579.80	2.475%	49332.81387	-18596.20669
Jun 03, 2020	1,541.65	0.387%	7723.91906	-18544.65116
Jun 02, 2020	1,535.70	1.010%	20127.59726	-18459.76197
Jun 01, 2020	1,520.35	3.821%	76167.11452	-18058.89079
May 29, 2020	1,464.40	-0.533%	-10629.5585	-17894.90172
May 28, 2020	1,472.25	1.847%	36821.82214	-17840.9416
May 27, 2020	1,445.55	1.510%	30098.18827	-17559.84573
May 26, 2020	1,424.05	-0.524%	-10444.36101	-17198.38819
May 22, 2020	1,431.55	-0.673%	-13417.12749	-17168.56599
May 21, 2020	1,441.25	0.527%	10498.22313	-17075.13653
May 20, 2020	1,433.70	1.760%	35091.2343	-17008.13782
May 19, 2020	1,408.90	-2.211%	-44070.49627	-16578.21188
May 18, 2020	1,440.75	-1.278%	-25476.02268	-16561.30919
May 15, 2020	1,459.40	1.633%	32555.97166	-16494.07474
May 14, 2020	1,435.95	-4.043%	-80597.26352	-16116.18494
May 13, 2020	1,496.45	2.122%	42296.41146	-16114.77748
May 12, 2020	1,465.36	-6.186%	-123327.7655	-15855.92015
May 11, 2020	1,561.99	0.960%	19147.81111	-15789.24875
May 08, 2020	1,547.13	3.639%	72554.64329	-15376.68964
May 07, 2020	1,492.80	3.163%	63056.5942	-15117.6617
May 06, 2020	1,447.03	0.007%	137.777916	-15081.36218
May 05, 2020	1,446.93	1.773%	35349.71408	-15013.37814

May 04, 2020	1,421.72	-2.101%	-41882.62913	-14968.65283
Apr 30, 2020	1,452.23	2.736%	54550.96318	-14841.4219
Apr 29, 2020	1,413.55	-0.084%	-1676.862533	-14781.36006
Apr 28, 2020	1,414.74	-0.112%	-2223.938799	-14657.80505
Apr 27, 2020	1,416.32	0.900%	17937.39109	-14634.732
Apr 24, 2020	1,403.69	3.362%	67027.60101	-14571.16003
Apr 23, 2020	1,358.03	0.535%	10670.24467	-14449.8033
Apr 22, 2020	1,350.80	10.204%	203416.1671	-14272.81108
Apr 21, 2020	1,225.73	-0.519%	-10338.91545	-14151.28362
Apr 20, 2020	1,232.12	1.617%	32241.80873	-14148.7206
Apr 17, 2020	1,212.51	4.791%	95501.15506	-14094.89608
Apr 16, 2020	1,157.08	1.583%	31555.86366	-13500.80079
Apr 15, 2020	1,139.05	-3.305%	-65883.03834	-13437.58426
Apr 13, 2020	1,177.98	-2.525%	-50329.92453	-13417.12749
Apr 09, 2020	1,208.49	2.331%	46472.72685	-12984.35286
Apr 08, 2020	1,180.96	-1.156%	-23042.86641	-12951.2093
Apr 07, 2020	1,194.77	11.940%	238031.3605	-12944.24229
Apr 03, 2020	1,067.33	-0.277%	-5531.947585	-12531.5367
Apr 01, 2020	1,070.30	-2.990%	-59610.08846	-12527.07464
Mar 31, 2020	1,103.29	8.084%	161160.4436	-12175.18571
Mar 30, 2020	1,020.77	-3.299%	-65759.82247	-11691.19312
Mar 27, 2020	1,055.59	-0.057%	-1132.4951	-11480.06048
Mar 26, 2020	1,056.19	-1.483%	-29566.0299	-10828.36111
Mar 25, 2020	1,072.09	14.718%	293420.081	-10629.5585
Mar 24, 2020	934.54	6.713%	133829.0659	-10444.36101
Mar 23, 2020	875.75	-13.154%	-262224.4092	-10338.91545
Mar 20, 2020	1,008.39	10.924%	217780.0089	-10142.28526
Mar 19, 2020	909.08	-5.246%	-104580.2853	-9668.899918
Mar 18, 2020	959.41	-3.918%	-78102.48666	-9551.687134
Mar 17, 2020	998.53	-0.758%	-15117.6617	-9501.340727
Mar 16, 2020	1,006.16	-8.107%	-161607.6955	-8674.353804
Mar 13, 2020	1,094.92	3.979%	79323.9872	-8514.018657
Mar 12, 2020	1,053.02	-7.850%	-156487.5341	-8452.195266
Mar 11, 2020	1,142.72	3.536%	70498.28892	-8408.900092
Mar 09, 2020	1,103.69	-12.341%	-246021.11	-8240.617725
Mar 06, 2020	1,259.07	-3.062%	-61041.76303	-8119.2763
Mar 05, 2020	1,298.84	-2.131%	-42481.15769	-8091.966724
Mar 04, 2020	1,327.12	-0.235%	-4675.754751	-7807.20468
Mar 03, 2020	1,330.24	2.029%	40443.16761	-7750.424118
Mar 02, 2020	1,303.79	-0.941%	-18751.49031	-7616.749179
Feb 28, 2020	1,316.17	-4.155%	-82835.33203	-7326.784199
Feb 27, 2020	1,373.23	-0.413%	-8240.617725	-7285.138022
Feb 26, 2020	1,378.93	-1.723%	-34341.17561	-7237.119152

Feb 25, 2020	1,403.10	-1.976%	-39386.88119	-6919.71458
Feb 24, 2020	1,431.38	-2.760%	-55012.22894	-6852.199483
Feb 20, 2020	1,472.00	-1.187%	-23660.09076	-6531.686855
Feb 19, 2020	1,489.68	2.481%	49454.06158	-6197.733781
Feb 18, 2020	1,453.62	-0.734%	-14634.732	-6050.910573
Feb 17, 2020	1,464.37	-0.628%	-12527.07464	-5861.701326
Feb 14, 2020	1,473.63	0.912%	18183.86918	-5833.967391
Feb 13, 2020	1,460.31	0.262%	5228.570742	-5792.487581
Feb 12, 2020	1,456.49	1.208%	24075.92123	-5671.30468
Feb 11, 2020	1,439.11	1.195%	23816.84703	-5604.120182
Feb 10, 2020	1,422.12	0.136%	2709.180814	-5531.947585
Feb 07, 2020	1,420.19	-1.656%	-33020.83359	-5468.945021
Feb 06, 2020	1,444.11	0.642%	12795.73176	-5200.320784
Feb 05, 2020	1,434.90	1.549%	30883.5815	-5163.599419
Feb 04, 2020	1,413.01	2.952%	58855.5443	-5097.263097
Feb 03, 2020	1,372.49	0.155%	3098.646706	-4958.536365
Feb 01, 2020	1,370.36	-2.004%	-39959.67255	-4943.000191
Jan 31, 2020	1,398.39	-2.223%	-44326.20141	-4675.754751
Jan 30, 2020	1,430.19	-2.439%	-48630.13609	-4675.491517
Jan 29, 2020	1,465.95	0.550%	10966.41883	-4554.37621
Jan 28, 2020	1,457.93	-2.310%	-46045.07404	-4482.164252
Jan 27, 2020	1,492.40	-0.986%	-19654.30848	-4375.204624
Jan 24, 2020	1,507.26	-0.347%	-6919.71458	-4222.096532
Jan 23, 2020	1,512.51	-0.424%	-8452.195266	-4113.66428
Jan 22, 2020	1,518.95	-0.036%	-721.5876933	-3145.503156
Jan 21, 2020	1,519.50	0.101%	2022.495323	-3097.494031
Jan 20, 2020	1,517.96	-3.077%	-61340.97915	-3079.723741
Jan 17, 2020	1,566.15	2.802%	55862.73975	-2895.989677
Jan 16, 2020	1,523.46	0.922%	18383.22668	-2609.033404
Jan 15, 2020	1,509.54	-0.363%	-7237.119152	-2533.505594
Jan 14, 2020	1,515.04	-0.926%	-18459.76197	-2371.854277
Jan 13, 2020	1,529.20	-0.256%	-5097.263097	-2323.071196
Jan 10, 2020	1,533.12	-0.022%	-442.0115295	-2272.603747
Jan 09, 2020	1,533.46	2.303%	45910.67421	-2223.938799
Jan 08, 2020	1,498.94	-0.751%	-14968.65283	-2024.530017
Jan 07, 2020	1,510.28	1.538%	30665.87603	-1949.4054
Jan 06, 2020	1,487.40	-2.320%	-46241.05942	-1676.862533
Jan 03, 2020	1,522.72	0.121%	2411.848404	-1667.149218
Jan 02, 2020	1,520.88	1.703%	33940.82131	-1662.483758
Jan 01, 2020	1,495.42	-0.294%	-5861.701326	-1633.130632
Dec 31, 2019	1,499.83	-1.953%	-38927.46192	-1593.530089
Dec 30, 2019	1,529.70	0.120%	2387.766302	-1191.958146
Dec 27, 2019	1,527.87	1.779%	35457.53312	-1132.4951

Dec 26, 2019	1,501.17	-2.008%	-40028.98174	-721.5876933
Dec 24, 2019	1,531.93	-1.587%	-31645.48033	-648.6605206
Dec 23, 2019	1,556.64	-1.732%	-34532.98571	-493.8522898
Dec 20, 2019	1,584.08	-0.674%	-13437.58426	-448.7066948
Dec 19, 2019	1,594.83	2.164%	43138.98914	-442.0115295
Dec 18, 2019	1,561.05	0.841%	16767.13048	-182.162503
Dec 17, 2019	1,548.03	-0.249%	-4958.536365	-81.65066597
Dec 16, 2019	1,551.89	-1.030%	-20532.53265	0
Dec 13, 2019	1,568.04	0.938%	18697.5117	137.777916
Dec 12, 2019	1,553.47	0.371%	7393.393551	366.4950823
Dec 11, 2019	1,547.73	0.029%	579.7900186	579.7900186
Dec 10, 2019	1,547.28	-0.677%	-13500.80079	605.3626467
Dec 09, 2019	1,557.83	1.138%	22688.39285	708.3581321
Dec 06, 2019	1,540.30	0.261%	5203.532862	886.2091439
Dec 05, 2019	1,536.29	-0.119%	-2371.854277	997.7259576
Dec 04, 2019	1,538.12	-1.659%	-33075.64399	1022.177492
Dec 03, 2019	1,564.07	-0.479%	-9551.687134	1264.24452
Dec 02, 2019	1,571.60	2.279%	45434.74534	1337.752331
Nov 29, 2019	1,536.58	-1.845%	-36777.51204	2022.495323
Nov 28, 2019	1,565.46	0.666%	13268.02766	2243.80485
Nov 27, 2019	1,555.11	0.615%	12266.21409	2387.766302
Nov 26, 2019	1,545.60	-0.083%	-1662.483758	2397.610457
Nov 25, 2019	1,546.89	0.973%	19402.23143	2411.848404
Nov 22, 2019	1,531.98	0.579%	11543.83715	2709.180814
Nov 21, 2019	1,523.16	-0.650%	-12951.2093	3046.124462
Nov 20, 2019	1,533.12	2.511%	50053.02493	3098.646706
Nov 19, 2019	1,495.57	3.464%	69053.64822	3213.315722
Nov 18, 2019	1,445.50	-0.792%	-15789.24875	3228.56271
Nov 15, 2019	1,457.04	0.554%	11047.68532	3314.255205
Nov 14, 2019	1,449.01	-0.649%	-12944.24229	3889.43204
Nov 13, 2019	1,458.48	3.117%	62143.83551	4217.354994
Nov 11, 2019	1,414.39	-1.225%	-24419.3969	4246.502229
Nov 08, 2019	1,431.93	-0.898%	-17894.90172	4420.488962
Nov 07, 2019	1,444.90	1.651%	32916.58295	4496.83178
Nov 06, 2019	1,421.43	-0.857%	-17075.13653	4764.762513
Nov 05, 2019	1,433.71	-0.710%	-14151.28362	4900.375186
Nov 04, 2019	1,443.96	0.051%	1022.177492	4912.742581
Nov 01, 2019	1,443.22	-0.509%	-10142.28526	4953.72191
Oct 31, 2019	1,450.60	-0.997%	-19878.21916	5010.049296
Oct 30, 2019	1,465.21	0.822%	16378.91582	5182.41425
Oct 29, 2019	1,453.27	2.287%	45587.9443	5203.532862
Oct 27, 2019	1,420.78	0.213%	4246.502229	5228.570742
Oct 25, 2019	1,417.76	-0.365%	-7285.138022	5242.207192



Oct 24, 2019	1,422.96	3.163%	63058.57663	5305.391553
Oct 23, 2019	1,379.33	-1.538%	-30653.14198	5310.460047
Oct 22, 2019	1,400.87	-0.155%	-3097.494031	5345.886093
Oct 18, 2019	1,403.05	1.421%	28331.26812	5385.418074
Oct 17, 2019	1,383.39	1.760%	35091.61836	5771.686561
Oct 16, 2019	1,359.46	0.601%	11978.94386	5943.850572
Oct 15, 2019	1,351.34	0.453%	9024.879762	6006.6619
Oct 14, 2019	1,345.25	0.399%	7959.916785	6027.26373
Oct 11, 2019	1,339.90	-0.744%	-14841.4219	6275.653626
Oct 10, 2019	1,349.95	2.868%	57179.49417	6327.780717
Oct 09, 2019	1,312.31	1.118%	22288.80452	6443.396031
Oct 07, 2019	1,297.80	0.153%	3046.124462	6922.699864
Oct 04, 2019	1,295.82	-0.225%	-4482.164252	7171.886242
Oct 03, 2019	1,298.74	0.471%	9392.116582	7393.393551
Oct 01, 2019	1,292.65	-2.053%	-40921.14318	7723.91906
Sep 30, 2019	1,319.74	1.772%	35327.87794	7796.944417
Sep 27, 2019	1,296.76	0.945%	18839.57668	7959.916785
Sep 26, 2019	1,284.62	1.347%	26862.92661	8051.120053
Sep 25, 2019	1,267.54	0.067%	1337.752331	8551.085421
Sep 24, 2019	1,266.69	3.188%	63546.88284	8592.064936
Sep 23, 2019	1,227.56	-1.208%	-24081.68997	9024.879762
Sep 20, 2019	1,242.57	6.386%	127312.8774	9289.235855
Sep 19, 2019	1,167.98	-2.210%	-44064.46859	9335.404096
Sep 18, 2019	1,194.38	0.689%	13730.5397	9392.116582
Sep 17, 2019	1,186.21	-1.098%	-21890.52135	9521.497188
Sep 16, 2019	1,199.38	-1.212%	-24153.99229	10498.22313
Sep 13, 2019	1,214.09	1.260%	25123.47203	10670.24467
Sep 12, 2019	1,198.98	-1.949%	-38850.10468	10755.14046
Sep 11, 2019	1,222.81	0.999%	19907.17879	10923.20643
Sep 09, 2019	1,210.72	-0.025%	-493.8522898	10966.41883
Sep 06, 2019	1,211.02	1.994%	39741.71769	11003.62065
Sep 05, 2019	1,187.35	-0.212%	-4222.096532	11027.3757
Sep 04, 2019	1,189.87	-0.435%	-8674.353804	11047.68532
Sep 03, 2019	1,195.07	-3.376%	-67309.69333	11082.09596
Aug 30, 2019	1,236.83	0.548%	10923.20643	11470.18378
Aug 29, 2019	1,230.09	-1.706%	-34010.65373	11536.63957
Aug 28, 2019	1,251.44	-0.906%	-18058.89079	11543.83715
Aug 27, 2019	1,262.88	0.636%	12677.12885	11600.08108
Aug 26, 2019	1,254.90	-0.710%	-14148.7206	11725.25876
Aug 23, 2019	1,263.87	2.334%	46536.18223	11978.94386
Aug 22, 2019	1,235.04	-1.905%	-37970.26973	12232.96594
Aug 21, 2019	1,259.02	-0.392%	-7807.20468	12266.21409
Aug 20, 2019	1,263.97	-1.288%	-25673.30452	12303.32588

Aug 19, 2019	1,280.46	1.142%	22769.93128	12677.12885
Aug 16, 2019	1,266.00	-0.795%	-15855.92015	12795.73176
Aug 14, 2019	1,276.15	1.059%	21107.21068	13118.86336
Aug 13, 2019	1,262.78	9.693%	193243.7256	13174.43453
Aug 09, 2019	1,151.19	0.846%	16870.07175	13268.02766
Aug 08, 2019	1,141.53	3.872%	77185.71084	13310.44264
Aug 07, 2019	1,098.98	-1.676%	-33406.86896	13345.58615
Aug 06, 2019	1,117.71	-1.316%	-26226.05751	13401.34407
Aug 05, 2019	1,132.61	-3.462%	-69021.42035	13643.25242
Aug 02, 2019	1,173.23	0.347%	6922.699864	13730.5397
Aug 01, 2019	1,169.17	1.201%	23933.64364	14112.55564
Jul 31, 2019	1,155.30	-1.240%	-24727.44335	15118.36948
Jul 30, 2019	1,169.81	-2.482%	-49473.96881	15146.62792
Jul 29, 2019	1,199.58	-0.235%	-4675.491517	15312.50963
Jul 26, 2019	1,202.40	-1.438%	-28662.77604	15884.80113
Jul 25, 2019	1,219.94	-2.192%	-43698.01248	16378.91582
Jul 24, 2019	1,247.28	-1.134%	-22612.49732	16512.23232
Jul 23, 2019	1,261.59	-0.543%	-10828.36111	16767.13048
Jul 22, 2019	1,268.48	2.522%	50287.08002	16851.2735
Jul 19, 2019	1,237.27	-1.018%	-20302.3132	16870.07175
Jul 18, 2019	1,250.00	-1.560%	-31100.89344	17541.02064
Jul 17, 2019	1,269.81	-0.863%	-17198.38819	17716.23703
Jul 16, 2019	1,280.86	1.324%	26399.41382	17937.39109
Jul 15, 2019	1,264.12	-0.344%	-6852.199483	17999.44075
Jul 12, 2019	1,268.48	-0.082%	-1633.130632	18183.86918
Jul 11, 2019	1,269.52	0.212%	4217.354994	18383.22668
Jul 10, 2019	1,266.84	-0.098%	-1949.4054	18697.5117
Jul 09, 2019	1,268.08	2.241%	44667.58137	18736.37218
Jul 08, 2019	1,240.29	-0.895%	-17840.9416	18839.57668
Jul 05, 2019	1,251.49	-1.608%	-32051.903	18859.72426
Jul 04, 2019	1,271.94	0.113%	2243.80485	19147.81111
Jul 03, 2019	1,270.51	0.317%	6327.780717	19402.23143
Jul 02, 2019	1,266.49	0.760%	15146.62792	19878.17689
Jul 01, 2019	1,256.94	1.258%	25069.3333	19907.17879
Jun 28, 2019	1,241.33	-1.653%	-32947.06265	19930.27943
Jun 27, 2019	1,262.19	-1.545%	-30805.1681	20127.59726
Jun 26, 2019	1,282.00	-0.131%	-2609.033404	20265.48669
Jun 25, 2019	1,283.68	2.649%	52813.81112	20900.05977
Jun 24, 2019	1,250.55	-1.336%	-26643.78969	21107.21068
Jun 21, 2019	1,267.49	-1.330%	-26506.79527	21171.92051
Jun 20, 2019	1,284.57	1.518%	30264.98032	22288.80452
Jun 19, 2019	1,265.36	-0.284%	-5671.30468	22688.39285
Jun 18, 2019	1,268.97	-0.102%	-2024.530017	22769.93128

Jun 17, 2019	1,270.26	-2.675%	-53337.29141	23050.75252
Jun 14, 2019	1,305.18	-0.731%	-14571.16003	23403.97931
Jun 13, 2019	1,314.79	-0.368%	-7326.784199	23524.93148
Jun 12, 2019	1,319.64	0.226%	4496.83178	23816.84703
Jun 11, 2019	1,316.67	0.758%	15118.36948	23882.99655
Jun 10, 2019	1,306.76	0.323%	6443.396031	23933.64364
Jun 07, 2019	1,302.55	-0.938%	-18709.09886	24075.92123
Jun 06, 2019	1,314.89	-1.798%	-35837.32785	25069.3333
Jun 04, 2019	1,338.96	-0.629%	-12531.5367	25123.47203
Jun 03, 2019	1,347.43	2.259%	45040.43797	25350.04997
May 31, 2019	1,317.66	0.030%	605.3626467	25906.03046
May 30, 2019	1,317.26	1.272%	25350.04997	25928.01779
May 29, 2019	1,300.72	-0.808%	-16114.77748	25929.16623
May 28, 2019	1,311.32	1.000%	19930.27943	26101.0949
May 27, 2019	1,298.34	-1.960%	-39079.17994	26399.41382
May 24, 2019	1,324.30	0.222%	4420.488962	26862.92661
May 23, 2019	1,321.37	-0.485%	-9668.899918	27145.87794
May 22, 2019	1,327.81	0.044%	886.2091439	27403.98283
May 21, 2019	1,327.22	1.048%	20900.05977	27560.86646
May 20, 2019	1,313.45	4.616%	92016.10713	28331.26812
May 17, 2019	1,255.50	0.162%	3228.56271	28872.83417
May 16, 2019	1,253.47	0.672%	13401.34407	29104.94299
May 15, 2019	1,245.10	-0.281%	-5604.120182	29635.4168
May 14, 2019	1,248.61	2.305%	45947.95613	29919.46741
May 13, 2019	1,220.48	-1.527%	-30432.43989	30098.18827
May 10, 2019	1,239.40	-0.422%	-8408.900092	30264.98032
May 09, 2019	1,244.65	-3.309%	-65974.1542	30665.87603
May 08, 2019	1,287.25	-3.278%	-65354.19159	30883.5815
May 07, 2019	1,330.88	-2.990%	-59607.42109	31199.64922
May 06, 2019	1,371.90	-1.700%	-33882.43648	31555.86366
May 03, 2019	1,395.62	0.270%	5385.418074	31719.18703
May 02, 2019	1,391.86	0.880%	17541.02064	32241.80873
Apr 30, 2019	1,379.72	0.000%	0	32309.86436
Apr 26, 2019	1,379.72	1.487%	29635.4168	32555.97166
Apr 25, 2019	1,359.51	-1.231%	-24534.66308	32812.10089
Apr 24, 2019	1,376.45	1.881%	37494.15672	32906.65017
Apr 23, 2019	1,351.04	1.375%	27403.98283	32916.58295
Apr 22, 2019	1,332.72	-2.929%	-58400.6446	32976.50944
Apr 18, 2019	1,372.94	3.141%	62616.21742	33196.66959
Apr 16, 2019	1,331.13	0.268%	5345.886093	33940.82131
Apr 15, 2019	1,327.57	-0.219%	-4375.204624	34380.32294
Apr 12, 2019	1,330.49	-0.274%	-5468.945021	35091.2343
Apr 11, 2019	1,334.15	1.156%	23050.75252	35091.61836

Apr 10, 2019	1,318.90	-0.228%	-4554.37621	35327.87794
Apr 09, 2019	1,321.92	0.391%	7796.944417	35349.71408
Apr 08, 2019	1,316.77	-1.821%	-36297.98239	35457.53312
Apr 05, 2019	1,341.19	0.063%	1264.24452	36191.75901
Apr 04, 2019	1,340.34	-1.611%	-32121.22419	36821.82214
Apr 03, 2019	1,362.29	-1.043%	-20794.95732	37029.65458
Apr 02, 2019	1,376.65	-0.154%	-3079.723741	37494.15672
Apr 01, 2019	1,378.78	2.098%	41821.07557	38898.75394
Mar 29, 2019	1,350.45	0.239%	4764.762513	39111.68883
Mar 28, 2019	1,347.23	0.797%	15884.80113	39129.55091
Mar 27, 2019	1,336.58	-1.316%	-26243.89697	39190.14436
Mar 26, 2019	1,354.41	3.232%	64425.21017	39649.66545
Mar 25, 2019	1,312.01	-1.290%	-25707.74329	39741.71769
Mar 22, 2019	1,329.15	-2.450%	-48839.0707	40443.16761
Mar 20, 2019	1,362.53	-0.080%	-1593.530089	41665.71196
Mar 19, 2019	1,363.62	1.963%	39129.55091	41821.07557
Mar 18, 2019	1,337.37	2.149%	42832.91184	42296.41146
Mar 15, 2019	1,309.24	-1.483%	-29566.85391	42525.33875
Mar 14, 2019	1,328.95	-0.427%	-8514.018657	42832.91184
Mar 13, 2019	1,334.65	1.198%	23882.99655	43138.98914
Mar 12, 2019	1,318.85	2.090%	41665.71196	43555.50387
Mar 11, 2019	1,291.85	2.920%	58208.73765	43723.69314
Mar 08, 2019	1,255.20	-0.248%	-4943.000191	44667.58137
Mar 07, 2019	1,258.32	0.431%	8592.064936	45040.43797
Mar 06, 2019	1,252.92	2.193%	43723.69314	45391.95915
Mar 05, 2019	1,226.03	0.946%	18859.72426	45434.74534
Mar 01, 2019	1,214.54	-0.406%	-8091.966724	45587.9443
Feb 28, 2019	1,219.49	0.617%	12303.32588	45910.67421
Feb 27, 2019	1,212.01	0.266%	5310.460047	45947.95613
Feb 26, 2019	1,208.79	-0.978%	-19498.97766	46472.72685
Feb 25, 2019	1,220.73	-0.004%	-81.65066597	46536.18223
Feb 22, 2019	1,220.78	-1.167%	-23257.19565	49332.81387
Feb 21, 2019	1,235.19	1.017%	20265.48669	49454.06158
Feb 20, 2019	1,222.76	1.501%	29919.46741	50043.92392
Feb 19, 2019	1,204.68	-0.328%	-6531.686855	50053.02493
Feb 18, 2019	1,208.64	-1.957%	-39005.50472	50287.08002
Feb 15, 2019	1,232.76	1.654%	32976.50944	51326.50918
Feb 14, 2019	1,212.70	-1.746%	-34807.37492	52444.56846
Feb 13, 2019	1,234.25	-0.832%	-16578.21188	52813.81112
Feb 12, 2019	1,244.60	0.251%	5010.049296	52852.38941
Feb 11, 2019	1,241.48	-1.914%	-38147.88734	53519.45609
Feb 08, 2019	1,265.70	-0.984%	-19619.22192	53631.36491
Feb 07, 2019	1,278.28	-1.515%	-30211.58635	53735.06712

Feb 06, 2019	1,297.95	1.448%	28872.83417	54550.96318
Feb 05, 2019	1,279.42	0.050%	997.7259576	55862.73975
Feb 04, 2019	1,278.78	3.277%	65318.7452	57179.49417
Feb 01, 2019	1,238.21	1.857%	37029.65458	58208.73765
Jan 31, 2019	1,215.63	2.631%	52444.56846	58792.92312
Jan 30, 2019	1,184.47	-1.235%	-24618.50068	58855.5443
Jan 29, 2019	1,199.28	-1.537%	-30639.78325	59705.58399
Jan 28, 2019	1,218.00	-1.321%	-26326.55351	60452.42273
Jan 25, 2019	1,234.30	-0.117%	-2323.071196	62143.83551
Jan 24, 2019	1,235.74	1.725%	34380.32294	62616.21742
Jan 23, 2019	1,214.79	-0.716%	-14272.81108	63056.5942
Jan 22, 2019	1,223.55	-0.206%	-4113.66428	63058.57663
Jan 21, 2019	1,226.08	4.505%	89802.61117	63546.88284
Jan 18, 2019	1,173.23	4.398%	87685.68829	64425.21017
Jan 17, 2019	1,123.80	-0.127%	-2533.505594	65318.7452
Jan 16, 2019	1,125.23	0.553%	11027.3757	66248.55629
Jan 15, 2019	1,119.04	2.995%	59705.58399	67027.60101
Jan 14, 2019	1,086.50	-0.114%	-2272.603747	67658.31172
Jan 11, 2019	1,087.74	-0.853%	-17008.13782	69053.64822
Jan 10, 2019	1,097.10	-0.293%	-5833.967391	70498.28892
Jan 09, 2019	1,100.32	0.552%	11003.62065	71249.98322
Jan 08, 2019	1,094.28	-0.009%	-182.162503	72554.64329
Jan 07, 2019	1,094.38	0.556%	11082.09596	73863.22285
Jan 04, 2019	1,088.33	0.539%	10755.14046	75612.13939
Jan 03, 2019	1,082.49	-1.234%	-24591.74278	76167.11452
Jan 02, 2019	1,096.01	-1.302%	-25959.03806	77185.71084
Jan 01, 2019	1,110.47	-0.023%	-448.7066948	79323.9872
Dec 31, 2018	1,110.72	-0.382%	-7616.749179	85591.47755
Dec 28, 2018	1,114.98	0.478%	9521.497188	87685.68829
Dec 27, 2018	1,109.68	1.989%	39649.66545	89802.61117
Dec 26, 2018	1,088.04	0.845%	16851.2735	92016.10713
Dec 24, 2018	1,078.92	-1.005%	-20029.33607	95501.15506
Dec 21, 2018	1,089.87	-2.503%	-49898.93903	124604.3994
Dec 20, 2018	1,117.85	-0.735%	-14657.80505	127312.8774
Dec 19, 2018	1,126.13	0.036%	708.3581321	133829.0659
Dec 18, 2018	1,125.73	0.575%	11470.18378	140511.0403
Dec 17, 2018	1,119.29	1.591%	31719.18703	140798.7635
Dec 14, 2018	1,101.76	0.466%	9289.235855	161160.4436
Dec 13, 2018	1,096.65	-0.311%	-6197.733781	193243.7256
Dec 12, 2018	1,100.07	1.180%	23524.93148	203416.1671
Dec 11, 2018	1,087.24	0.669%	13345.58615	217780.0089
Dec 10, 2018	1,080.01	-3.841%	-76571.91559	238031.3605
Dec 07, 2018	1,123.15	0.903%	17999.44075	293420.081



*What are the steps in Historical Simulation? I had clearly dictated in class.-*

*Suppose, we are holding 1000 shares of Reliance Industries trading at Rs. 1993.55. So, the value of our position is Rs. 19,93,550. Now, we want to find out the 95% daily VaR.*

**Step 1** - *We go to the NSE website and extract say 501 days historical data for the closing price of Reliance Industries, giving us 500 daily percentage returns.*

**Step 2** - *We apply these percentages on Rs. 19,93,550 Portfolio value getting 500 possible gains/losses which can occur between today and tomorrow.*

**Step 3** - *We arrange them from worst to best, and slice out 5%, giving us the 95% daily VaR. It comes to –Rs. (61041.763). Please check the attached Excel sheet. (Sheet 1)*

*Thus, historical simulation does not assume any distribution and that's the best part of historical simulation. Is it given in the ICAI mat? Yes, but in a very bad manner – You know the cut-copy-paste stuff. How will students then know it? If students have done my classes ardently, they will know the same and remember the same for the exam. However, if students are in their own world and not wanting to apply their brains and just wander around YouTube stuff, they will get “garbage”. You may check out YouTube videos and you'll find that according to YouTubers, Option A is a correct statement. This means, according to those YouTubers, Historical Simulation assumes Normal distribution. And when somebody pointed out to them, they mention that “ Yes! We did it wrong and we'll rectify it when taking proper classes.” Every person, including myself can commit mistakes. However, just imagine that there is a CA Final Cost teacher and he writes –*

*Contribution = Sales – Fixed Cost.*

*Is it possible that a person can be a Cost teacher if he writes this? – It's not a mistake! It's out of the world **blunder** and a mockery of CA Final and a deep disrespect to where we are heading towards. If students can rely on these people to prepare them for CA Final, I have only one thing to say – RIP!!*

**Option B. Assumption of constant correlation is not required.**

The statement is correct. Yes, because Historical Simulation does not assume any correlation. Correlation constancy is assumed by Delta Normal method. Hope you remember –

$$\text{VaR of Portfolio} = \text{SQRT}(\text{VaR}^2\text{A} + \text{VaR}^2\text{B} + 2 \times r \times \text{VaR A} \times \text{VaR B})$$

**Option C. Assumption of constant delta is not needed.**

The statement is correct. We don't need any assumption in Historical Simulation. The delta normal method assumes constant delta. Remember linear derivatives discussed in class?

**Option D. It is one of the method of calculation of VaR.**

The statement is correct. Obviously, delta normal method, Historical Simulation, Bootstrap Simulation and Monte Carlo Simulation are methods of calculating VaR as per Page 5.4 and 5.5 of ICAI Study Mat.

**Sanjay Sir's Comment :**

*I think I have said enough. **Average Performance would be good.** In fact, the YouTuber had mentioned Option B or C as the correct answer and referred that this is “conceptual”.....are you getting it?*

**3.4. Option A. ERM decisions are always ignored across a business when a top-down approach is used.**

It seems to be incorrect. If ERM is implemented via a Top down approach , it cannot be ignored.

**Option B. Financial constraints could compromise the implementation of ERM systems.**

*It is difficult to say whether its correct or incorrect. Many articles have stated that insufficient capital is one of the reasons for ERM failure but then ICAI study mat pg no 9.15 talks about leveraging existing resources for implementing ERM.*

**Option C. Management can never override ERM decisions.**

This statement is correct.It is good that management cannot override ERM. We know fully well that failure occurs when ERM decisions are not respected by management.

**Option D. The use of ERM systems do not give the required assistance to risk managers.**

This option doesn't seem to fit in over here given what has been asked in the question.So if the question was to choose the odd one out, we could have taken this.

*So I think answer should be Option B but I would like to wait for ICAI answer to this.*

**Sanjay Sir's Comment :**

*The question could have been more nicely designed. That's the problem with ICAI. Based on luck, people must've tried – hence, **Average Performance would have been average***

### 3.5. Let me first of all make you revise MCS.

Suppose, we are holding 1000 shares of Reliance Industries trading at Rs. 1993.55. So, the value of our position is Rs. 19,93,550. Now, we want to find out the 95% daily VaR using Monte Carlo Simulation.

**Step 1** – Extract Historical data from the NSE Website of RIL for say 501 days, with respect to their Closing Price and calculate the daily returns of the same. ( Same as Historical Simulation)

**Step 2** – Calculate the Mean and Standard Deviation (=average , =stdev:s) of the daily

**Step 3** – Simulate the daily returns using the Normal Distribution assumption and the Mean&SD calculated above. ( Excel command : NORMINV(RAND(), MEAN,SD))

**Step 4** – Apply the simulated returns on the Portfolio Value i.e. Rs.19,93,550 and you get Portfolio Gains/Losses (Simulated)

**Step 5** – Arrange the Simulated Portfolio Gains/Losses form Worst to best and slice out the 95% VaR.

Calculation of 95% VaR using Monte Carlo Simulation method	
Stock	<b>Reliance Industries Ltd.</b>
Date	12/14/2020
Quantity	1000
Price	1,993.55
Portfolio Value	<b>1993550</b>
Mean	0.145%
SD	2.407%
95% VaR	<b>-75211.2754</b>

Date	Price	Returns	Simulated Returns	Simulated Gains/Losses	Worst To Best
Dec 14, 2020	1,993.55	-0.611%	2.581%	51444.42906	-180519.0997
Dec 11, 2020	2,005.80	-0.060%	2.280%	45459.67559	-119979.0305
Dec 10, 2020	2,007.00	-0.984%	3.200%	63794.37724	-116492.3922
Dec 09, 2020	2,026.95	1.665%	-3.379%	-67363.40501	-113231.7918
Dec 08, 2020	1,993.75	1.815%	0.574%	11448.56596	-100989.1328
Dec 07, 2020	1,958.20	0.588%	1.293%	25769.28154	-100236.8549
Dec 04, 2020	1,946.75	-0.881%	-0.154%	-3079.958347	-99031.28777
Dec 03, 2020	1,964.05	0.301%	-3.181%	-63418.00376	-90918.97549

Dec 02, 2020	1,958.15	0.166%		-1.058%	-21095.6742	-90433.18524
Dec 01, 2020	1,954.90	1.301%		0.767%	15289.66897	-90327.12312
Nov 27, 2020	1,929.80	-1.168%		3.804%	75842.69106	-86623.47854
Nov 26, 2020	1,952.60	0.246%		-0.001%	-18.58412153	-86600.93674
Nov 25, 2020	1,947.80	-0.827%		-1.065%	-21229.8765	-85995.20591
Nov 24, 2020	1,964.05	0.684%		-1.089%	-21701.69146	-84553.94146
Nov 23, 2020	1,950.70	2.695%		2.518%	50189.47391	-83768.76347
Nov 20, 2020	1,899.50	-3.733%		2.946%	58734.85672	-82317.24731
Nov 19, 2020	1,973.15	-0.707%		0.776%	15461.7814	-81816.93268
Nov 18, 2020	1,987.20	-0.304%		-2.247%	-44799.95993	-81594.45415
Nov 17, 2020	1,993.25	-0.158%		-0.255%	-5079.063413	-81457.18843
Nov 13, 2020	1,996.40	0.828%		-1.310%	-26120.86408	-80282.45507
Nov 12, 2020	1,980.00	-0.861%		2.586%	51552.99008	-77090.93374
Nov 11, 2020	1,997.20	-4.190%		0.150%	2996.956885	-76638.11981
Nov 10, 2020	2,084.55	1.651%		4.147%	82666.833	-75747.84926
Nov 09, 2020	2,050.70	1.062%		0.730%	14553.78268	-75300.1378
Nov 06, 2020	2,029.15	3.793%		0.289%	5760.50235	<b>-75211.2754</b>
Nov 05, 2020	1,955.00	2.185%		0.259%	5165.58127	-72328.16979
Nov 04, 2020	1,913.20	3.394%		-3.072%	-61248.81548	-71357.32259
Nov 03, 2020	1,850.40	-1.441%		1.608%	32061.85432	-70962.44367
Nov 02, 2020	1,877.45	-8.618%		1.677%	33432.78182	-70910.7992
Oct 30, 2020	2,054.50	1.362%		-2.259%	-45025.08749	-69201.12303
Oct 29, 2020	2,026.90	0.768%		-4.167%	-83064.59715	-68524.09027
Oct 28, 2020	2,011.45	-1.133%		-3.160%	-62996.53789	-68290.17506
Oct 27, 2020	2,034.50	0.266%		0.015%	290.8376065	-67694.25055
Oct 26, 2020	2,029.10	-3.973%		0.731%	14577.89197	-67690.6652
Oct 23, 2020	2,113.05	0.290%		-0.843%	-16805.82035	-67671.36147
Oct 22, 2020	2,106.95	-0.831%		0.870%	17340.57237	-66259.07256
Oct 21, 2020	2,124.60	-1.452%		2.776%	55337.83205	-65746.98721
Oct 20, 2020	2,155.90	-0.933%		2.831%	56444.77132	-65315.16764
Oct 19, 2020	2,176.20	0.018%		0.334%	6656.010983	-65179.80134
Oct 16, 2020	2,175.80	-1.391%		1.299%	25898.61058	-64638.27695
Oct 15, 2020	2,206.50	-3.541%		0.289%	5758.277928	-64605.66684
Oct 14, 2020	2,287.50	0.298%		3.208%	63959.84219	-64501.75467
Oct 13, 2020	2,280.70	1.951%		-0.624%	-12447.59052	-64448.01987
Oct 12, 2020	2,237.05	0.161%		1.516%	30224.87748	-63867.83986
Oct 09, 2020	2,233.45	-0.259%		5.005%	99768.65924	-63548.53446
Oct 08, 2020	2,239.25	-0.808%		1.365%	27221.56357	-61802.6751
Oct 07, 2020	2,257.50	2.133%		2.170%	43257.56903	-60224.07327
Oct 06, 2020	2,210.35	-0.084%		-2.680%	-53424.04308	-60187.11635
Oct 05, 2020	2,212.20	-0.586%		-1.427%	-28441.34916	-60103.96691
Oct 01, 2020	2,225.25	-0.407%		0.940%	18747.35813	-59438.79214
Sep 30, 2020	2,234.35	-0.477%		-1.395%	-27812.96025	-59341.60454



Sep 29, 2020	2,245.05	1.299%		2.280%	45462.74371	-58708.28964
Sep 28, 2020	2,216.25	0.661%		1.309%	26091.76057	-58645.11336
Sep 25, 2020	2,201.70	0.940%		2.286%	45573.48067	-58607.40017
Sep 24, 2020	2,181.20	-2.223%		-2.547%	-50774.92724	-58169.5451
Sep 23, 2020	2,230.80	0.889%		0.661%	13183.49693	-57019.79081
Sep 22, 2020	2,211.15	-1.982%		2.839%	56606.78826	-56719.77109
Sep 21, 2020	2,255.85	-2.162%		-0.197%	-3923.048468	-56417.7709
Sep 18, 2020	2,305.70	0.302%		3.449%	68756.60227	-55844.87187
Sep 17, 2020	2,298.75	-1.110%		-0.616%	-12290.16331	-55500.74459
Sep 16, 2020	2,324.55	0.246%		4.619%	92077.85106	-55056.63765
Sep 15, 2020	2,318.85	0.708%		-0.913%	-18191.64699	-54628.61786
Sep 14, 2020	2,302.55	-0.741%		0.542%	10809.58802	-54280.06945
Sep 11, 2020	2,319.75	0.248%		-0.584%	-11638.04954	-53438.7778
Sep 10, 2020	2,314.00	7.063%		-0.648%	-12925.91708	-52885.44334
Sep 09, 2020	2,161.35	2.575%		-0.928%	-18508.18473	-52871.30059
Sep 08, 2020	2,107.10	1.174%		3.063%	61055.668	-52829.03333
Sep 07, 2020	2,082.65	0.260%		2.289%	45627.40689	-52357.63718
Sep 04, 2020	2,077.25	-1.650%		2.571%	51244.78065	-52234.47362
Sep 03, 2020	2,112.10	-0.757%		-3.011%	-60020.61142	-52106.14113
Sep 02, 2020	2,128.20	1.962%		-2.293%	-45716.58601	-51507.51668
Sep 01, 2020	2,087.25	0.315%		0.785%	15657.39462	-51242.71021
Aug 31, 2020	2,080.70	-1.675%		1.673%	33351.2088	-49358.21942
Aug 28, 2020	2,116.15	0.263%		-1.181%	-23534.03445	-49331.97475
Aug 27, 2020	2,110.60	-1.249%		0.230%	4579.61056	-48978.32306
Aug 26, 2020	2,137.30	2.651%		0.773%	15401.04111	-48451.79768
Aug 25, 2020	2,082.10	-0.651%		1.321%	26335.50685	-48418.37869
Aug 24, 2020	2,095.75	0.668%		1.360%	27122.1828	-47857.96812
Aug 21, 2020	2,081.85	-0.725%		0.298%	5943.011111	-47140.83487
Aug 20, 2020	2,097.05	-1.619%		-3.664%	-73040.81468	-46869.77924
Aug 19, 2020	2,131.55	0.614%		-0.857%	-17085.61092	-46434.41047
Aug 18, 2020	2,118.55	1.301%		-2.765%	-55123.57878	-46252.95539
Aug 17, 2020	2,091.35	-1.062%		1.841%	36695.16332	-46203.80242
Aug 14, 2020	2,113.80	-0.389%		-3.086%	-61522.05347	-45212.63986
Aug 13, 2020	2,122.05	-0.261%		2.422%	48293.4918	-45068.80086
Aug 12, 2020	2,127.60	-0.291%		4.142%	82579.56961	-44072.21285
Aug 11, 2020	2,133.80	0.658%		-1.088%	-21698.49556	-43776.63472
Aug 10, 2020	2,119.85	-1.239%		-2.038%	-40621.03026	-43577.05711
Aug 07, 2020	2,146.45	0.579%		-3.427%	-68317.22401	-43505.35169
Aug 06, 2020	2,134.10	0.360%		1.402%	27952.00794	-43030.30544
Aug 05, 2020	2,126.45	-1.123%		-1.436%	-28624.89372	-42994.46558
Aug 04, 2020	2,150.60	7.048%		1.000%	19932.32733	-42900.06916
Aug 03, 2020	2,009.00	-2.811%		-1.505%	-30006.71924	-42664.69915
Jul 31, 2020	2,067.10	-1.980%		-4.410%	-87915.60533	-42603.30537

Jul 30, 2020	2,108.85	0.582%		1.002%	19967.65306	-42481.51992
Jul 29, 2020	2,096.65	-3.722%		0.748%	14921.6755	-41695.70575
Jul 28, 2020	2,177.70	0.997%		-1.842%	-36716.16647	-41491.05211
Jul 27, 2020	2,156.20	0.468%		2.105%	41964.56829	-41273.70817
Jul 24, 2020	2,146.15	4.293%		-1.212%	-24155.87896	-41266.82684
Jul 23, 2020	2,057.80	2.685%		-0.100%	-1992.626646	-40905.89569
Jul 22, 2020	2,004.00	1.646%		-3.480%	-69371.01219	-40750.27225
Jul 21, 2020	1,971.55	2.690%		-3.138%	-62567.12695	-40669.96516
Jul 20, 2020	1,919.90	0.429%		1.647%	32827.99576	-40461.48516
Jul 17, 2020	1,911.70	3.705%		0.388%	7743.765629	-40365.4296
Jul 16, 2020	1,843.40	-0.033%		-1.165%	-23223.05724	-39996.41486
Jul 15, 2020	1,844.00	-3.808%		3.000%	59797.82221	-39620.21109
Jul 14, 2020	1,917.00	-0.930%		1.297%	25854.48906	-39407.61625
Jul 13, 2020	1,935.00	3.032%		-0.744%	-14835.27814	-39215.08355
Jul 10, 2020	1,878.05	2.949%		0.002%	48.01262361	-39188.24782
Jul 09, 2020	1,824.25	1.460%		1.951%	38903.20012	-38623.97371
Jul 08, 2020	1,798.00	-1.396%		3.687%	73497.56303	-38191.28294
Jul 07, 2020	1,823.45	-1.531%		2.081%	41476.23989	-37844.10664
Jul 06, 2020	1,851.80	3.574%		2.333%	46518.89983	-37588.68072
Jul 03, 2020	1,787.90	1.565%		2.632%	52470.83723	-37318.88511
Jul 02, 2020	1,760.35	1.309%		-0.068%	-1347.205805	-36796.62471
Jul 01, 2020	1,737.60	1.966%		4.945%	98576.68477	-36767.90128
Jun 30, 2020	1,704.10	-1.106%		-0.182%	-3627.919519	-35427.33063
Jun 29, 2020	1,723.15	-1.062%		2.503%	49902.572	-34420.21649
Jun 26, 2020	1,741.65	1.383%		-4.681%	-93310.32733	-33562.83297
Jun 25, 2020	1,717.90	-0.576%		-2.560%	-51043.25979	-33428.95186
Jun 24, 2020	1,727.85	0.404%		2.498%	49796.84557	-33140.5952
Jun 23, 2020	1,720.90	-1.446%		4.691%	93519.34933	-32991.30495
Jun 22, 2020	1,746.15	-0.753%		-1.345%	-26818.11871	-32894.66619
Jun 19, 2020	1,759.40	6.250%		0.045%	890.0558777	-32734.9498
Jun 18, 2020	1,655.90	2.510%		2.465%	49145.87475	-32363.37313
Jun 17, 2020	1,615.35	-0.145%		-2.780%	-55427.99335	-31348.42971
Jun 16, 2020	1,617.70	0.195%		4.650%	92709.29075	-30869.97573
Jun 15, 2020	1,614.55	1.621%		5.077%	101210.9113	-29877.14521
Jun 12, 2020	1,588.80	3.323%		-4.058%	-80894.87388	-29478.92825
Jun 11, 2020	1,537.70	-2.191%		-2.143%	-42723.94525	-29274.62469
Jun 10, 2020	1,572.15	2.277%		1.337%	26663.65761	-29132.31294
Jun 09, 2020	1,537.15	-2.061%		-0.265%	-5280.405372	-29075.22602
Jun 08, 2020	1,569.50	-0.771%		-1.415%	-28214.62832	-27131.00666
Jun 05, 2020	1,581.70	0.120%		2.456%	48965.31091	-27013.6575
Jun 04, 2020	1,579.80	2.475%		4.320%	86129.30836	-26647.26217
Jun 03, 2020	1,541.65	0.387%		-0.341%	-6801.906603	-26340.12782
Jun 02, 2020	1,535.70	1.010%		4.340%	86523.32757	-26025.57106

Jun 01, 2020	1,520.35	3.821%		-0.146%	-2905.095885	-25546.52447
May 29, 2020	1,464.40	-0.533%		-1.183%	-23589.86129	-25488.30478
May 28, 2020	1,472.25	1.847%		-0.417%	-8321.933916	-25374.024
May 27, 2020	1,445.55	1.510%		-3.214%	-64070.52208	-25103.65769
May 26, 2020	1,424.05	-0.524%		0.320%	6369.764036	-24823.86241
May 22, 2020	1,431.55	-0.673%		-1.167%	-23259.63016	-24793.09382
May 21, 2020	1,441.25	0.527%		3.571%	71195.86553	-24389.56693
May 20, 2020	1,433.70	1.760%		-1.745%	-34780.32608	-24228.59696
May 19, 2020	1,408.90	-2.211%		-2.716%	-54148.36409	-23984.26274
May 18, 2020	1,440.75	-1.278%		-3.647%	-72709.76104	-23808.42807
May 15, 2020	1,459.40	1.633%		-0.219%	-4369.314462	-23754.67843
May 14, 2020	1,435.95	-4.043%		-6.258%	-124760.2171	-23638.24541
May 13, 2020	1,496.45	2.122%		-0.131%	-2604.69849	-23610.3847
May 12, 2020	1,465.36	-6.186%		-1.042%	-20774.69839	-23200.74405
May 11, 2020	1,561.99	0.960%		1.513%	30171.19459	-23126.65938
May 08, 2020	1,547.13	3.639%		3.595%	71666.19161	-22963.79908
May 07, 2020	1,492.80	3.163%		-2.319%	-46221.76022	-22510.61999
May 06, 2020	1,447.03	0.007%		0.635%	12654.97933	-22460.59491
May 05, 2020	1,446.93	1.773%		1.566%	31216.12999	-21488.86091
May 04, 2020	1,421.72	-2.101%		-0.320%	-6382.379572	-21235.57563
Apr 30, 2020	1,452.23	2.736%		-2.081%	-41478.59597	-21115.05768
Apr 29, 2020	1,413.55	-0.084%		4.800%	95683.12805	-20820.51102
Apr 28, 2020	1,414.74	-0.112%		-0.137%	-2729.929494	-20510.31721
Apr 27, 2020	1,416.32	0.900%		4.108%	81900.15153	-20350.87015
Apr 24, 2020	1,403.69	3.362%		0.153%	3055.354731	-20323.69464
Apr 23, 2020	1,358.03	0.535%		-2.348%	-46809.85418	-20307.63278
Apr 22, 2020	1,350.80	10.204%		3.084%	61484.99476	-20007.95666
Apr 21, 2020	1,225.73	-0.519%		-0.434%	-8642.26558	-19988.82483
Apr 20, 2020	1,232.12	1.617%		-2.574%	-51308.43812	-19878.70542
Apr 17, 2020	1,212.51	4.791%		-2.588%	-51595.0035	-19848.22822
Apr 16, 2020	1,157.08	1.583%		-4.364%	-86996.07411	-19355.08486
Apr 15, 2020	1,139.05	-3.305%		-1.847%	-36811.21066	-19196.02442
Apr 13, 2020	1,177.98	-2.525%		-0.580%	-11568.5402	-18922.44535
Apr 09, 2020	1,208.49	2.331%		-10.121%	-201760.4661	-18797.41293
Apr 08, 2020	1,180.96	-1.156%		2.805%	55911.5443	-18556.25692
Apr 07, 2020	1,194.77	11.940%		0.948%	18889.88531	-18237.34962
Apr 03, 2020	1,067.33	-0.277%		2.369%	47217.38714	-18072.98087
Apr 01, 2020	1,070.30	-2.990%		0.905%	18035.79426	-17442.3044
Mar 31, 2020	1,103.29	8.084%		0.148%	2945.877438	-16888.20188
Mar 30, 2020	1,020.77	-3.299%		-1.084%	-21615.19817	-16702.44573
Mar 27, 2020	1,055.59	-0.057%		-1.962%	-39111.62157	-16675.9339
Mar 26, 2020	1,056.19	-1.483%		-0.166%	-3313.624645	-16626.67871
Mar 25, 2020	1,072.09	14.718%		0.700%	13949.16048	-16483.94976

Mar 24, 2020	934.54	6.713%		-1.299%	-25888.29623	-16296.52426
Mar 23, 2020	875.75	-13.154%		-4.138%	-82500.76972	-15468.47972
Mar 20, 2020	1,008.39	10.924%		-1.306%	-26026.38976	-15399.37089
Mar 19, 2020	909.08	-5.246%		-0.471%	-9395.125389	-15253.54269
Mar 18, 2020	959.41	-3.918%		-3.595%	-71658.7027	-15055.55827
Mar 17, 2020	998.53	-0.758%		-2.372%	-47287.70347	-14224.70351
Mar 16, 2020	1,006.16	-8.107%		5.436%	108360.5518	-13742.9269
Mar 13, 2020	1,094.92	3.979%		-1.100%	-21926.00623	-13656.62689
Mar 12, 2020	1,053.02	-7.850%		0.598%	11915.66049	-13413.91926
Mar 11, 2020	1,142.72	3.536%		-2.396%	-47757.04819	-13374.26506
Mar 09, 2020	1,103.69	-12.341%		-0.112%	-2239.706188	-13175.59436
Mar 06, 2020	1,259.07	-3.062%		-2.952%	-58844.90572	-13002.80236
Mar 05, 2020	1,298.84	-2.131%		-2.917%	-58161.08539	-12187.09862
Mar 04, 2020	1,327.12	-0.235%		-0.158%	-3155.301115	-12009.46628
Mar 03, 2020	1,330.24	2.029%		5.525%	110141.6325	-11938.07638
Mar 02, 2020	1,303.79	-0.941%		-1.294%	-25803.86645	-11744.02407
Feb 28, 2020	1,316.17	-4.155%		5.082%	101316.4656	-11631.51628
Feb 27, 2020	1,373.23	-0.413%		2.451%	48852.02856	-11617.9218
Feb 26, 2020	1,378.93	-1.723%		-1.945%	-38767.45935	-10628.93845
Feb 25, 2020	1,403.10	-1.976%		-4.644%	-92586.66027	-10168.5214
Feb 24, 2020	1,431.38	-2.760%		-0.804%	-16023.87512	-10146.4297
Feb 20, 2020	1,472.00	-1.187%		-0.130%	-2587.019164	-10038.49857
Feb 19, 2020	1,489.68	2.481%		0.158%	3142.831429	-9585.64616
Feb 18, 2020	1,453.62	-0.734%		-0.039%	-786.6383002	-9516.745558
Feb 17, 2020	1,464.37	-0.628%		-0.129%	-2576.802885	-8897.346998
Feb 14, 2020	1,473.63	0.912%		-2.958%	-58974.23142	-8568.730176
Feb 13, 2020	1,460.31	0.262%		-2.380%	-47450.12576	-8055.294395
Feb 12, 2020	1,456.49	1.208%		-1.253%	-24976.71103	-8033.504153
Feb 11, 2020	1,439.11	1.195%		0.795%	15854.5912	-7941.142352
Feb 10, 2020	1,422.12	0.136%		3.114%	62081.37034	-7749.135945
Feb 07, 2020	1,420.19	-1.656%		-1.011%	-20157.43737	-7626.583826
Feb 06, 2020	1,444.11	0.642%		-3.304%	-65858.06762	-7529.615562
Feb 05, 2020	1,434.90	1.549%		-0.400%	-7974.651383	-7128.346109
Feb 04, 2020	1,413.01	2.952%		-0.790%	-15750.57087	-5611.413867
Feb 03, 2020	1,372.49	0.155%		0.863%	17198.04317	-4460.302453
Feb 01, 2020	1,370.36	-2.004%		0.403%	8034.083683	-4451.767849
Jan 31, 2020	1,398.39	-2.223%		-0.734%	-14626.94577	-4334.904762
Jan 30, 2020	1,430.19	-2.439%		4.259%	84904.33974	-4328.601302
Jan 29, 2020	1,465.95	0.550%		1.091%	21745.10752	-4007.415093
Jan 28, 2020	1,457.93	-2.310%		-2.083%	-41526.25531	-3243.578273
Jan 27, 2020	1,492.40	-0.986%		2.542%	50675.26218	-2969.550156
Jan 24, 2020	1,507.26	-0.347%		-5.866%	-116938.2497	-2552.707776
Jan 23, 2020	1,512.51	-0.424%		-2.906%	-57929.40531	-2417.923107

Jan 22, 2020	1,518.95	-0.036%		1.153%	22987.52465	-2244.13828
Jan 21, 2020	1,519.50	0.101%		4.450%	88708.47523	-2194.340616
Jan 20, 2020	1,517.96	-3.077%		-0.113%	-2243.194011	-2052.320007
Jan 17, 2020	1,566.15	2.802%		-0.193%	-3855.568802	-1719.095041
Jan 16, 2020	1,523.46	0.922%		-2.550%	-50839.89669	-604.1811555
Jan 15, 2020	1,509.54	-0.363%		1.228%	24476.03913	-483.0947339
Jan 14, 2020	1,515.04	-0.926%		1.220%	24328.76565	-189.5089731
Jan 13, 2020	1,529.20	-0.256%		0.108%	2157.87993	-76.10676417
Jan 10, 2020	1,533.12	-0.022%		0.237%	4731.382937	630.8148491
Jan 09, 2020	1,533.46	2.303%		1.875%	37378.83718	676.0721786
Jan 08, 2020	1,498.94	-0.751%		1.819%	36264.64729	821.0830503
Jan 07, 2020	1,510.28	1.538%		-0.536%	-10691.07552	904.5690047
Jan 06, 2020	1,487.40	-2.320%		-3.795%	-75659.45352	1134.889379
Jan 03, 2020	1,522.72	0.121%		1.357%	27042.77455	1576.017396
Jan 02, 2020	1,520.88	1.703%		1.882%	37509.07973	1821.415278
Jan 01, 2020	1,495.42	-0.294%		-2.646%	-52745.97993	2049.097095
Dec 31, 2019	1,499.83	-1.953%		-0.536%	-10687.17716	2662.606798
Dec 30, 2019	1,529.70	0.120%		1.243%	24783.34145	2796.146732
Dec 27, 2019	1,527.87	1.779%		-6.536%	-130295.2555	2977.583841
Dec 26, 2019	1,501.17	-2.008%		-2.821%	-56236.30378	3525.685653
Dec 24, 2019	1,531.93	-1.587%		-2.114%	-42145.97586	3957.717774
Dec 23, 2019	1,556.64	-1.732%		-3.816%	-76078.79365	4008.957304
Dec 20, 2019	1,584.08	-0.674%		1.861%	37109.88466	4430.378304
Dec 19, 2019	1,594.83	2.164%		-0.197%	-3925.892154	4633.039839
Dec 18, 2019	1,561.05	0.841%		-0.925%	-18431.5392	4770.058111
Dec 17, 2019	1,548.03	-0.249%		-2.984%	-59487.95303	5350.346595
Dec 16, 2019	1,551.89	-1.030%		2.398%	47801.4956	5743.359248
Dec 13, 2019	1,568.04	0.938%		-1.810%	-36092.94123	6004.604343
Dec 12, 2019	1,553.47	0.371%		1.779%	35463.93354	6346.263461
Dec 11, 2019	1,547.73	0.029%		-0.942%	-18784.43648	6778.078266
Dec 10, 2019	1,547.28	-0.677%		-0.098%	-1957.952988	6945.113575
Dec 09, 2019	1,557.83	1.138%		2.286%	45575.25279	7191.007888
Dec 06, 2019	1,540.30	0.261%		2.458%	49005.58604	7504.048532
Dec 05, 2019	1,536.29	-0.119%		3.283%	65440.735	7592.273553
Dec 04, 2019	1,538.12	-1.659%		0.149%	2966.800622	7775.091606
Dec 03, 2019	1,564.07	-0.479%		0.980%	19542.38465	8020.254929
Dec 02, 2019	1,571.60	2.279%		2.805%	55917.96973	8722.900045
Nov 29, 2019	1,536.58	-1.845%		1.342%	26749.18812	9118.805783
Nov 28, 2019	1,565.46	0.666%		3.637%	72508.30141	9364.1239
Nov 27, 2019	1,555.11	0.615%		-2.648%	-52781.32732	10067.2685
Nov 26, 2019	1,545.60	-0.083%		1.361%	27129.41274	10168.81372
Nov 25, 2019	1,546.89	0.973%		0.273%	5434.149773	10234.26194
Nov 22, 2019	1,531.98	0.579%		0.119%	2362.523108	10390.39333



Nov 21, 2019	1,523.16	-0.650%		2.703%	53893.8884	10568.29744
Nov 20, 2019	1,533.12	2.511%		-1.710%	-34095.9783	10627.58917
Nov 19, 2019	1,495.57	3.464%		1.477%	29451.99937	10778.03617
Nov 18, 2019	1,445.50	-0.792%		3.567%	71104.34584	11355.89229
Nov 15, 2019	1,457.04	0.554%		7.288%	145295.8506	11903.73665
Nov 14, 2019	1,449.01	-0.649%		1.457%	29049.39967	11934.29252
Nov 13, 2019	1,458.48	3.117%		-0.727%	-14493.45863	12147.42099
Nov 11, 2019	1,414.39	-1.225%		2.672%	53260.95197	12433.56858
Nov 08, 2019	1,431.93	-0.898%		3.306%	65907.76367	12732.50831
Nov 07, 2019	1,444.90	1.651%		2.986%	59537.02666	12823.48121
Nov 06, 2019	1,421.43	-0.857%		1.436%	28618.86403	13024.11859
Nov 05, 2019	1,433.71	-0.710%		-0.584%	-11643.31146	13558.30346
Nov 04, 2019	1,443.96	0.051%		-1.609%	-32075.17507	13793.37063
Nov 01, 2019	1,443.22	-0.509%		0.256%	5102.480183	13999.96374
Oct 31, 2019	1,450.60	-0.997%		-1.065%	-21228.59886	14314.4626
Oct 30, 2019	1,465.21	0.822%		0.548%	10922.02775	14637.62268
Oct 29, 2019	1,453.27	2.287%		-1.096%	-21859.23342	14691.3963
Oct 27, 2019	1,420.78	0.213%		-2.377%	-47381.72206	14920.29562
Oct 25, 2019	1,417.76	-0.365%		-2.613%	-52082.03686	15009.4399
Oct 24, 2019	1,422.96	3.163%		-0.471%	-9386.594245	15265.666
Oct 23, 2019	1,379.33	-1.538%		-2.155%	-42962.535	15445.49196
Oct 22, 2019	1,400.87	-0.155%		-1.478%	-29471.29228	15458.16248
Oct 18, 2019	1,403.05	1.421%		0.690%	13746.53982	15635.15159
Oct 17, 2019	1,383.39	1.760%		-3.125%	-62289.69787	15667.20644
Oct 16, 2019	1,359.46	0.601%		-0.983%	-19598.54755	16001.65414
Oct 15, 2019	1,351.34	0.453%		-2.171%	-43285.77875	16649.67788
Oct 14, 2019	1,345.25	0.399%		4.602%	91752.48925	17020.74055
Oct 11, 2019	1,339.90	-0.744%		-5.645%	-112543.8471	17206.88063
Oct 10, 2019	1,349.95	2.868%		-4.103%	-81789.21061	17290.34873
Oct 09, 2019	1,312.31	1.118%		-0.335%	-6672.715895	17298.77143
Oct 07, 2019	1,297.80	0.153%		0.897%	17889.74538	17370.77489
Oct 04, 2019	1,295.82	-0.225%		3.915%	78051.59734	17940.43795
Oct 03, 2019	1,298.74	0.471%		-0.831%	-16558.80696	17979.7071
Oct 01, 2019	1,292.65	-2.053%		-5.500%	-109637.7148	18161.34354
Sep 30, 2019	1,319.74	1.772%		-0.105%	-2086.898417	18414.64446
Sep 27, 2019	1,296.76	0.945%		-0.478%	-9522.207219	18721.03528
Sep 26, 2019	1,284.62	1.347%		1.609%	32068.8134	19510.05796
Sep 25, 2019	1,267.54	0.067%		-1.545%	-30809.70579	19749.79731
Sep 24, 2019	1,266.69	3.188%		-3.648%	-72725.16052	19881.09504
Sep 23, 2019	1,227.56	-1.208%		-1.380%	-27502.08126	20364.95074
Sep 20, 2019	1,242.57	6.386%		-2.203%	-43915.04179	21253.02489
Sep 19, 2019	1,167.98	-2.210%		-2.117%	-42194.24352	21418.89148
Sep 18, 2019	1,194.38	0.689%		-1.019%	-20320.81302	21427.45032

Sep 17, 2019	1,186.21	-1.098%		-0.629%	-12546.77324	21912.05337
Sep 16, 2019	1,199.38	-1.212%		-5.165%	-102975.0522	22109.96784
Sep 13, 2019	1,214.09	1.260%		0.143%	2847.504685	22138.07954
Sep 12, 2019	1,198.98	-1.949%		3.147%	62744.39804	22266.12295
Sep 11, 2019	1,222.81	0.999%		-0.615%	-12252.51121	22483.08664
Sep 09, 2019	1,210.72	-0.025%		0.917%	18271.28302	22603.62061
Sep 06, 2019	1,211.02	1.994%		-3.186%	-63517.19696	22890.76553
Sep 05, 2019	1,187.35	-0.212%		0.285%	5678.687395	23115.24539
Sep 04, 2019	1,189.87	-0.435%		-1.673%	-33360.55117	23344.23928
Sep 03, 2019	1,195.07	-3.376%		-3.164%	-63081.0559	23732.80675
Aug 30, 2019	1,236.83	0.548%		2.629%	52412.52439	23800.1239
Aug 29, 2019	1,230.09	-1.706%		1.847%	36819.88217	23984.73769
Aug 28, 2019	1,251.44	-0.906%		-1.049%	-20912.91491	24172.10967
Aug 27, 2019	1,262.88	0.636%		0.564%	11251.3902	24199.39168
Aug 26, 2019	1,254.90	-0.710%		-2.955%	-58913.21746	24472.1648
Aug 23, 2019	1,263.87	2.334%		-0.451%	-8994.812694	24986.67158
Aug 22, 2019	1,235.04	-1.905%		1.804%	35953.87052	25024.10934
Aug 21, 2019	1,259.02	-0.392%		-0.947%	-18877.9414	25117.43896
Aug 20, 2019	1,263.97	-1.288%		-1.318%	-26281.56058	25126.0663
Aug 19, 2019	1,280.46	1.142%		-3.019%	-60190.58882	25266.32097
Aug 16, 2019	1,266.00	-0.795%		-1.254%	-24998.90095	26398.58102
Aug 14, 2019	1,276.15	1.059%		-2.532%	-50470.85586	26833.86667
Aug 13, 2019	1,262.78	9.693%		2.841%	56642.65216	27224.69992
Aug 09, 2019	1,151.19	0.846%		-2.054%	-40942.39784	27490.01907
Aug 08, 2019	1,141.53	3.872%		-3.023%	-60257.36794	27929.06565
Aug 07, 2019	1,098.98	-1.676%		-6.634%	-132252.1535	28182.611
Aug 06, 2019	1,117.71	-1.316%		0.491%	9788.187838	28537.31913
Aug 05, 2019	1,132.61	-3.462%		-2.078%	-41423.72554	28732.07508
Aug 02, 2019	1,173.23	0.347%		1.083%	21583.36418	28845.32819
Aug 01, 2019	1,169.17	1.201%		3.253%	64849.46784	29287.50496
Jul 31, 2019	1,155.30	-1.240%		-0.907%	-18075.69823	29296.46857
Jul 30, 2019	1,169.81	-2.482%		1.303%	25977.6465	29450.30322
Jul 29, 2019	1,199.58	-0.235%		1.828%	36451.91196	29636.44825
Jul 26, 2019	1,202.40	-1.438%		-1.654%	-32976.63684	30336.60514
Jul 25, 2019	1,219.94	-2.192%		3.564%	71048.1435	30392.71528
Jul 24, 2019	1,247.28	-1.134%		-0.839%	-16732.8917	30794.26622
Jul 23, 2019	1,261.59	-0.543%		2.581%	51451.73825	31093.79806
Jul 22, 2019	1,268.48	2.522%		-0.509%	-10149.91308	31382.55419
Jul 19, 2019	1,237.27	-1.018%		1.847%	36829.20302	33090.7569
Jul 18, 2019	1,250.00	-1.560%		-2.956%	-58936.176	33340.445
Jul 17, 2019	1,269.81	-0.863%		-1.398%	-27876.93738	33418.394
Jul 16, 2019	1,280.86	1.324%		0.941%	18762.9211	33510.94518
Jul 15, 2019	1,264.12	-0.344%		0.514%	10255.99725	33541.45856

Jul 12, 2019	1,268.48	-0.082%		-1.570%	-31289.10138	33593.01939
Jul 11, 2019	1,269.52	0.212%		2.743%	54679.0483	33803.87641
Jul 10, 2019	1,266.84	-0.098%		2.047%	40800.26055	33967.16573
Jul 09, 2019	1,268.08	2.241%		-0.042%	-843.1753522	34016.72588
Jul 08, 2019	1,240.29	-0.895%		-1.923%	-38326.72639	34051.55835
Jul 05, 2019	1,251.49	-1.608%		-0.702%	-13989.74104	34062.50453
Jul 04, 2019	1,271.94	0.113%		0.670%	13349.90127	35337.6633
Jul 03, 2019	1,270.51	0.317%		0.450%	8973.77201	35615.56283
Jul 02, 2019	1,266.49	0.760%		1.133%	22589.59238	35688.05385
Jul 01, 2019	1,256.94	1.258%		0.161%	3212.611229	35712.57613
Jun 28, 2019	1,241.33	-1.653%		2.088%	41618.43927	36069.25281
Jun 27, 2019	1,262.19	-1.545%		4.729%	94272.19021	36126.0104
Jun 26, 2019	1,282.00	-0.131%		3.343%	66650.51772	36597.42263
Jun 25, 2019	1,283.68	2.649%		-4.355%	-86826.1923	37289.76587
Jun 24, 2019	1,250.55	-1.336%		-1.229%	-24501.31774	37657.23597
Jun 21, 2019	1,267.49	-1.330%		-4.272%	-85162.88014	37881.61601
Jun 20, 2019	1,284.57	1.518%		-2.997%	-59738.81353	38199.28087
Jun 19, 2019	1,265.36	-0.284%		0.127%	2526.19206	38199.35354
Jun 18, 2019	1,268.97	-0.102%		1.758%	35043.54624	38295.413
Jun 17, 2019	1,270.26	-2.675%		0.209%	4167.730196	38465.43156
Jun 14, 2019	1,305.18	-0.731%		1.962%	39112.96574	39690.48574
Jun 13, 2019	1,314.79	-0.368%		-2.430%	-48441.14087	39900.12746
Jun 12, 2019	1,319.64	0.226%		-2.992%	-59653.82173	40505.91399
Jun 11, 2019	1,316.67	0.758%		0.278%	5550.382835	41151.15684
Jun 10, 2019	1,306.76	0.323%		0.651%	12986.10387	41152.76222
Jun 07, 2019	1,302.55	-0.938%		-2.433%	-48510.25911	41503.1161
Jun 06, 2019	1,314.89	-1.798%		-0.432%	-8617.289235	41527.36861
Jun 04, 2019	1,338.96	-0.629%		-0.256%	-5096.068493	41533.00536
Jun 03, 2019	1,347.43	2.259%		-0.627%	-12490.66823	41760.21533
May 31, 2019	1,317.66	0.030%		0.214%	4264.224073	41760.79253
May 30, 2019	1,317.26	1.272%		-2.415%	-48141.53537	41870.06033
May 29, 2019	1,300.72	-0.808%		-1.063%	-21189.78179	42622.72124
May 28, 2019	1,311.32	1.000%		1.333%	26577.79959	42904.35939
May 27, 2019	1,298.34	-1.960%		-2.258%	-45017.90603	43274.91287
May 24, 2019	1,324.30	0.222%		4.406%	87842.05463	43282.51605
May 23, 2019	1,321.37	-0.485%		-1.198%	-23888.81854	43922.46824
May 22, 2019	1,327.81	0.044%		-0.168%	-3342.054925	45498.33751
May 21, 2019	1,327.22	1.048%		-2.884%	-57500.8536	45533.28929
May 20, 2019	1,313.45	4.616%		3.489%	69557.53576	46064.48203
May 17, 2019	1,255.50	0.162%		0.489%	9748.621571	46552.08094
May 16, 2019	1,253.47	0.672%		1.913%	38131.27581	46631.26359
May 15, 2019	1,245.10	-0.281%		-1.612%	-32144.47961	46745.02298
May 14, 2019	1,248.61	2.305%		3.785%	75458.33268	47008.9278

May 13, 2019	1,220.48	-1.527%		-0.534%	-10642.87857	47029.74941
May 10, 2019	1,239.40	-0.422%		-0.375%	-7471.405522	47447.54403
May 09, 2019	1,244.65	-3.309%		3.453%	68836.67198	47837.83758
May 08, 2019	1,287.25	-3.278%		-4.213%	-83985.80354	48504.76148
May 07, 2019	1,330.88	-2.990%		-1.235%	-24618.9133	48647.58865
May 06, 2019	1,371.90	-1.700%		-1.950%	-38867.63102	48962.85476
May 03, 2019	1,395.62	0.270%		1.730%	34491.13881	49320.1694
May 02, 2019	1,391.86	0.880%		2.959%	58987.42558	49480.39912
Apr 30, 2019	1,379.72	0.000%		0.685%	13650.18108	49799.70628
Apr 26, 2019	1,379.72	1.487%		-3.012%	-60052.74321	50559.62374
Apr 25, 2019	1,359.51	-1.231%		-0.525%	-10465.3013	50614.59832
Apr 24, 2019	1,376.45	1.881%		-1.594%	-31784.67261	50845.56736
Apr 23, 2019	1,351.04	1.375%		-1.635%	-32586.94025	51400.46822
Apr 22, 2019	1,332.72	-2.929%		-2.815%	-56127.81457	51462.66494
Apr 18, 2019	1,372.94	3.141%		2.144%	42746.9921	51812.76765
Apr 16, 2019	1,331.13	0.268%		-1.321%	-26341.79099	51834.58175
Apr 15, 2019	1,327.57	-0.219%		2.546%	50752.0714	51983.99906
Apr 12, 2019	1,330.49	-0.274%		0.363%	7235.742733	52532.32651
Apr 11, 2019	1,334.15	1.156%		-1.614%	-32183.0917	52536.51015
Apr 10, 2019	1,318.90	-0.228%		-0.746%	-14876.83551	52885.0067
Apr 09, 2019	1,321.92	0.391%		-3.856%	-76865.92484	53282.96367
Apr 08, 2019	1,316.77	-1.821%		-2.991%	-59617.62625	54089.24353
Apr 05, 2019	1,341.19	0.063%		1.723%	34340.77608	54465.77534
Apr 04, 2019	1,340.34	-1.611%		-1.992%	-39716.60273	54524.90967
Apr 03, 2019	1,362.29	-1.043%		-0.668%	-13326.66507	54617.10894
Apr 02, 2019	1,376.65	-0.154%		2.650%	52831.61347	54875.62435
Apr 01, 2019	1,378.78	2.098%		-0.133%	-2655.727734	55233.53487
Mar 29, 2019	1,350.45	0.239%		-0.964%	-19224.97442	55814.47342
Mar 28, 2019	1,347.23	0.797%		-4.666%	-93012.2313	56063.40679
Mar 27, 2019	1,336.58	-1.316%		-2.608%	-51987.56604	56221.93601
Mar 26, 2019	1,354.41	3.232%		-0.180%	-3586.835747	56242.86422
Mar 25, 2019	1,312.01	-1.290%		2.391%	47667.1872	56567.14581
Mar 22, 2019	1,329.15	-2.450%		4.054%	80817.22035	57265.21948
Mar 20, 2019	1,362.53	-0.080%		-1.778%	-35452.91787	57428.68743
Mar 19, 2019	1,363.62	1.963%		-0.833%	-16607.80941	57522.59397
Mar 18, 2019	1,337.37	2.149%		-0.955%	-19043.58026	57715.10643
Mar 15, 2019	1,309.24	-1.483%		-1.967%	-39215.12128	58382.85313
Mar 14, 2019	1,328.95	-0.427%		0.940%	18730.89194	58689.31668
Mar 13, 2019	1,334.65	1.198%		4.820%	96089.85622	59192.27213
Mar 12, 2019	1,318.85	2.090%		-3.205%	-63887.46864	59770.08407
Mar 11, 2019	1,291.85	2.920%		0.539%	10745.01046	60123.24413
Mar 08, 2019	1,255.20	-0.248%		-3.591%	-71582.88254	60298.8895
Mar 07, 2019	1,258.32	0.431%		-0.167%	-3336.982513	61691.9391



Mar 06, 2019	1,252.92	2.193%		3.662%	73012.41709	61965.4776
Mar 05, 2019	1,226.03	0.946%		1.516%	30222.22111	63080.14541
Mar 01, 2019	1,214.54	-0.406%		2.839%	56596.53873	63142.27086
Feb 28, 2019	1,219.49	0.617%		0.498%	9937.290209	64040.0298
Feb 27, 2019	1,212.01	0.266%		-2.097%	-41810.79747	64861.4541
Feb 26, 2019	1,208.79	-0.978%		-0.649%	-12939.97155	65053.78491
Feb 25, 2019	1,220.73	-0.004%		-1.284%	-25602.37264	65870.18501
Feb 22, 2019	1,220.78	-1.167%		4.154%	82810.67029	65901.40526
Feb 21, 2019	1,235.19	1.017%		1.152%	22970.50047	66085.68186
Feb 20, 2019	1,222.76	1.501%		-3.214%	-64081.62538	66340.94278
Feb 19, 2019	1,204.68	-0.328%		1.228%	24483.26652	66404.94219
Feb 18, 2019	1,208.64	-1.957%		0.619%	12345.07339	66425.78147
Feb 15, 2019	1,232.76	1.654%		-1.602%	-31936.70689	69566.34998
Feb 14, 2019	1,212.70	-1.746%		0.770%	15352.74876	69617.29396
Feb 13, 2019	1,234.25	-0.832%		3.026%	60324.64088	70466.02154
Feb 12, 2019	1,244.60	0.251%		4.667%	93036.33316	70733.40084
Feb 11, 2019	1,241.48	-1.914%		0.870%	17338.18773	70947.67635
Feb 08, 2019	1,265.70	-0.984%		0.030%	594.0078791	71076.29075
Feb 07, 2019	1,278.28	-1.515%		0.878%	17502.9309	73178.34144
Feb 06, 2019	1,297.95	1.448%		-1.317%	-26246.36742	73529.53917
Feb 05, 2019	1,279.42	0.050%		0.867%	17286.89545	73532.35405
Feb 04, 2019	1,278.78	3.277%		0.958%	19107.05762	74082.58002
Feb 01, 2019	1,238.21	1.857%		-1.802%	-35925.28104	74542.0109
Jan 31, 2019	1,215.63	2.631%		-1.391%	-27735.09495	76080.86588
Jan 30, 2019	1,184.47	-1.235%		-1.097%	-21875.8665	76161.99156
Jan 29, 2019	1,199.28	-1.537%		0.593%	11827.50487	76266.32821
Jan 28, 2019	1,218.00	-1.321%		-0.740%	-14750.35517	78546.39121
Jan 25, 2019	1,234.30	-0.117%		-2.212%	-44106.24411	79388.49651
Jan 24, 2019	1,235.74	1.725%		0.914%	18224.36724	79866.13052
Jan 23, 2019	1,214.79	-0.716%		0.113%	2244.672021	80579.75189
Jan 22, 2019	1,223.55	-0.206%		0.041%	823.4303818	80588.30813
Jan 21, 2019	1,226.08	4.505%		1.753%	34955.09599	80647.21082
Jan 18, 2019	1,173.23	4.398%		-0.557%	-11102.78748	80739.03517
Jan 17, 2019	1,123.80	-0.127%		-0.714%	-14237.97066	82586.97697
Jan 16, 2019	1,125.23	0.553%		-2.570%	-51230.87469	82591.02759
Jan 15, 2019	1,119.04	2.995%		4.243%	84593.18557	83336.47898
Jan 14, 2019	1,086.50	-0.114%		4.030%	80349.42062	83393.59501
Jan 11, 2019	1,087.74	-0.853%		0.371%	7394.610007	83702.85832
Jan 10, 2019	1,097.10	-0.293%		-4.703%	-93755.05216	83779.9709
Jan 09, 2019	1,100.32	0.552%		-2.093%	-41726.36235	85827.9338
Jan 08, 2019	1,094.28	-0.009%		-2.096%	-41787.33457	87945.06131
Jan 07, 2019	1,094.38	0.556%		1.493%	29770.53411	88207.16816
Jan 04, 2019	1,088.33	0.539%		-1.665%	-33198.24515	88209.85625



Jan 03, 2019	1,082.49	-1.234%		-0.602%	-12002.4688	91781.5285
Jan 02, 2019	1,096.01	-1.302%		-2.914%	-58093.04278	93068.77218
Jan 01, 2019	1,110.47	-0.023%		1.386%	27624.8011	93743.61605
Dec 31, 2018	1,110.72	-0.382%		-1.890%	-37670.16141	94118.32796
Dec 28, 2018	1,114.98	0.478%		2.170%	43260.6605	95027.28219
Dec 27, 2018	1,109.68	1.989%		-0.865%	-17234.31093	95286.2021
Dec 26, 2018	1,088.04	0.845%		-1.365%	-27219.1721	95710.90162
Dec 24, 2018	1,078.92	-1.005%		-1.808%	-36051.54447	96598.90861
Dec 21, 2018	1,089.87	-2.503%		2.054%	40945.60776	96833.32239
Dec 20, 2018	1,117.85	-0.735%		3.282%	65431.6069	97112.80807
Dec 19, 2018	1,126.13	0.036%		0.951%	18950.75271	98028.38839
Dec 18, 2018	1,125.73	0.575%		0.767%	15290.79644	101876.122
Dec 17, 2018	1,119.29	1.591%		2.564%	51118.06286	104869.5092
Dec 14, 2018	1,101.76	0.466%		-1.614%	-32184.01486	109597.668
Dec 13, 2018	1,096.65	-0.311%		-2.760%	-55023.64124	111940.8558
Dec 12, 2018	1,100.07	1.180%		0.966%	19259.1847	114446.8485
Dec 11, 2018	1,087.24	0.669%		-0.044%	-883.4967472	115920.6956
Dec 10, 2018	1,080.01	-3.841%		-2.995%	-59703.88838	130996.0859
Dec 07, 2018	1,123.15	0.903%		0.409%	8155.448905	183708.9748

**Option A. It can be useful for estimating the standalone risk of a project**

The statement is correct. MCS can be used to calculate both Standalone risk of a project as well as the risk of a Portfolio.

**Option B. It is capable of using probability distribution for variables as input data.**

The statement is correct. This is exactly what we do in MCS. We take a risk factor and assume a certain distribution. In my notes I had dictated, suppose normal, binomial or Poisson distribution and then we pick up a random value from those distributions.

**Option C. It is the most accurate risk analysis tool because it is based on real data.**

*The statement is incorrect. It is not the most accurate because it based on many assumptions of model, distributions and all that. So, it is not correct at all. Moreover, It is not based upon real data, it based upon hypothetical assumptions of distributions.*

**Option D. It produces both an expected value and a measure of the variability of that value.**

The statement is correct. We do calculate Mean and SD from the distribution of Portfolio Values generated.

**Sanjay Sir's Comment :**

*The question was simple and people should have got it right. **Average Performance would be good.***

## DESCRIPTIVE QUESTIONS

- 3.6.** The CRO's role has become all pervasive in most companies across the Globe – specially companies in the Energy sector, Technology sector, Financial Sector and other Risk intensive sectors.

CRO is the Organizational Leader for ERM. He/She should have the courage to push back on management, if they are steering the company into a direction where a company shouldn't go – taking on excessive risk or some kind of ethical or compliance issues – just that day to day safeguard and having the courage to push back is the attribute that's quintessential.

To provide organizational leadership to ensure that the company is moving in the right direction w.r.t. ERM program – the right people, process and technology.

Addressing day to day issues – Risky events, regulatory events, specific losses or incidents of responding to issues are the other key roles of the CRO.

Working with the board and making sure that the board is well served in it's Governance and Oversight responsibilities - providing the board with good reporting measurements.

### **Sanjay Sir's Comment :**

*This question is a clear cut portrayal of the fact that cut-copy-paste is not what you can do in an elective paper. Of course you know what is ERM and who is a CRO. However, you have to relate them in this question. I would be surprised if ICAI Copy-Pastes the write-up on CRO from the Study Mat which is not connected to ERM.*

### 3.7. A . OBSTACLES IN IMPLEMENTING ERM

1. CRO is yet to get authority and functional autonomy and is facing obstacle from the CEO.
2. Internal Audit team is not providing required support in the ERM implementation exercise as they believe this will reduce their authority in the organization.
3. While STEPOIL's executive officers were generally positive to the idea behind ERM, they still demand to know "What's in it for us?"
4. A large number of executives and some board members still feel that ERM is an administrative burden.
5. While, the CRO wishes to use VaR techniques for quantifying risks so that it's easier for the Board to understand, some of the Board Members has apprehension about effectiveness of the technique, considering it's mechanical process and limitation.
6. The Cyber Security team, managing the BCP argues that the BCP should not be linked to ERM and managed Separately.

#### ADDRESSING THE OBSTACLES

##### 1. **Winning support and sponsorship from the Top management is a precursor**

The Board of directors should sponsor the ERM function and activities by providing the right focus, resources and attention for ERM.

The organization and who has accepted responsibility for overall ERM leadership, resources and support to accomplish the effort.

2. The CRO demonstrated efforts of Mr. Aman and the benefits STEPOIL is getting after analysis of the costs and benefits from various financial transactions, mostly hedging and FX transactions going on in the company. They were able to show that the number of transactions, based on silo thinking were staggeringly high and made no sense at all.
3. The CRO is trying his best to convince the Board about developing a sophisticated approach to ERM that centers on the principle of value creation and has a vision to ensure that ERM is thoroughly embedded in

business unit's way of doing things despite the fact that it is yet to enjoy the wholehearted support of STEPOIL's executive officers and Board of Directors.

4. The CRO promised to get an assessment of risk culture done from an independent consultant, for which the Board is concerned about.
5. The ERM team should identify small number of critical and strategic risks that can be managed and then evolve from this start. This helps the organization's executives actually witness the achievement of ERM milestones, thereby being more confident about implementing the same.
6. Embed ERM into the Business fabric of the organization.

**B.**

- Traditionally, business continuity and risk management were content to coexist in very separate "silos" of responsibility, failing to take advantage of the efficiencies offered by integrated risk assessment and treatment.
- ERM provides the context to understand risks and how they interact with the business enterprise.
- Integrating BCP as part of a comprehensive ERM program allows a more reasoned and less emotional understanding of the universe of business risks faced by the company. This approach produces efficiencies with regards to how organizations react to catastrophic risk.
- In order to take risks intelligently, the organization needs a construct to evaluate risks from the boardroom to the mailroom – from power outages to hurricanes to data management or threats to brand equity.
- ERM provides a common governance structure that brings these disciplines together to provide oversight of the process and how it is pro-actively addressing risks like reputation, data quality, privacy of information and, yes, business interruption.
- By viewing BCP as a risk management function and embedding it into the enterprise level ERM program, which has been aligned with the strategic imperatives of the company, boardroom expectations are met and alignment achieved.



- The BCM program's effectiveness analysis provides a feedback loop to the overall ERM program, thereby providing comfort that resiliency and recoverability efforts reduce interruption risk impact.

### ILLUSTRATION

To illustrate how BCM and ERM can work together, consider a regulated company that needs to make state filings for rate increases. During the BIA, it was reported that the risk of lost revenue from not making timely filings (as a result of a major, unexpected disruption like a fire or long term power outage for example) would be in the range of \$2 – \$5 million per week. Through the BIA lens, then, this department would be deemed critical.

After the BIA, the people in the department responsible for the filings were interviewed using an ERM process of risk profiling. The risk of not making the filing (interruption of services from the filings department) was evaluated according to impact (similar to BIA but with an established ERM scale and criterion), likelihood and effectiveness of controls. These factors were combined into a single risk index for that specific department. It was determined that the risk index was relatively low due to existing controls including the ability to re-file renewal increases post disaster. This perspective indicates that the filings department is not “critical” after all. In other areas, the Enterprise Risk Management Assessment supported the BIA findings. For example, customer service functions were critical under both the BIA and the ERM assessment. What this supports is a decision around the application of limited resources. Developing extensive plans to recover customer service areas within a minimal amount for downtime is essential. Allocating resources to recover the filings department is foolish. Ah, the efficiency of ERM!

### 3.8. Stress Testing

The method suggested by Board Member is known as Stress Testing. Stress testing as a formal discipline for risk and capital management was born out of financial crises. Stress tests had previously been carried out for certain types of risk or for specific portfolios, but rarely for all the risks faced by an entire enterprise. For example, market risk stress testing was widely adopted in 1990s to supplement VaR measures, whose calculations tend to underestimate extreme losses. While these narrow stress tests were useful for managing specific risks or portfolios, they shed light on the overall effect that a stress event would have on an institution.

In case of STEPOIL, the method of Stress Testing suggested is the factor push method where, we calculate Stressed VaR by shocking risk factors by 10 SD.

### 3.9. Standard Way of Stress Testing

#### Stress Test Process



The above exhibit clearly provides a step-by-step process by which stress testing can be integrated into the decision-making system of a typical financial institution. The first step in the process is the generation of various scenarios. The scenario development incorporates both historical and hypothetical states of macroeconomic variables. It is important to select scenarios that appropriately reflect the idiosyncratic business profile of a particular financial institution.

The second step involves the segmentation of the current risk exposures with particular focus on risk concentration. It is essential to have detailed record of historical losses that correspond to the same level of granularity as the current exposure to enable temporal analysis. Historical losses in the form of

defaults, loss severities, and exposure details are explained by macroeconomic scenarios using regression based techniques.

The consequent relationships are then applied to the current portfolio to generate current assessments of income and expenses, losses and capital ratios etc. These results are then compared to the desired risk appetite of the financial institution. In case of a mismatch between actual and potential risk appetite, de-risking options could have an impact on the capital policy decisions of the financial institutions especially decisions involving dividends, share buybacks and compensation policies. The entire process is subjected to governance oversight at every level, beginning with scenario and model validation, to internal controls over data, and finally ending with clear communication and review by senior executives and the various board committees.

### **Information Provide by Stress Testing**

Almost all surveyed institutions use stress testing to measure capital adequacy. However, half or more also use it for risk reporting, risk appetite, limit setting and management, and various planning exercises (e.g. financial, strategic and contingency)

### **Examples of such extended uses of stress testing are:**

- **Risk Reporting** – Stress testing results are often used to report levels of risk in business activities – for example, by reporting the credit losses by portfolio in various stress scenarios would cause in specific portfolios, or by showing a business unit’s contribution to the P&L in a stress scenario.
- **Strategic Planning** – These results are increasingly integrated into business planning as institutions look to understand the impact of stress scenarios on alternative strategies and especially on the ability to pay dividends.
- **Risk Appetite** – Stress testing is increasingly being integrated into risk appetite, using tolerance for outcome in a stress to set risk appetite and cascade it down to risk appetite/ tolerance to individual products/ businesses.
- **Limits** – Stress testing expressions of risk appetite are often cascaded into limits at the enterprise level.

To a lesser extent, banks are using stress testing to inform capital allocation, credit portfolio structuring, performance measurement and management, pricing and original strategy.

### **Stress Test compliments VaR**

While VaR measures risk under normal circumstances, stress Test measures risk under abnormal circumstances.

The impetus for setting up enterprise-wide stress testing in most jurisdictions was a regulatory requirement around capital adequacy assessment. As a result, the early use of stress testing was narrow, focusing on whether there was sufficient capital to survive a stress event and what capital actions such as dividend payments etc. were possible. However, financial institutions have since built up their stress testing capabilities and explored ways of using it to the meet broader risk management and business objectives, specifically, for which applications or decisions will stress testing, will be a key input or a driver? Should risk appetite be articulated based upon tolerances in a stress environment? Should capital requirements from stress testing be used for performance management or loan pricing?

Various Reasons for incorporating stress testing results into a broader set of such risk and business applications.

- **Binding Constraint** – Stress test results have become the binding constraint for evaluating capital adequacy and the key driver of dividend policy for many institutions.
- **Management attention** – Given its linkage to dividend payments, as well as the governance requirements demanded by regulators, stress testing has the attention of senior management and the board of directors.
- **Intuition** – Many users find stress results to be more intuitive than other risk metrics because they are presented in an accounting framework, similar to other external communications regarding the institution's financial condition.



- **Transparency** – As outcomes are linked to casual factors in stress testing, such results are also more transparent and easier to understand than other risk metrics (such as economic capital).
- **Consistency** – The enterprise wide stress testing usually piggybacks the budgeting and planning process, which gives a degree of consistency with the inputs and approaches accepted already in a well established process.