Midterm 1, Financial Economics February 15, 2010

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All questions must be answered on this test form.

Question 1: A bank compounds interest on deposits monthly. If you deposit 1,000 Dollars for one year, than with compounded interest that deposit will be worth 1,050.00 Dollars. Complete the following table (reporting the amounts in Dollars and cents), assuming an initial deposit of 1,000 Dollars. *Show your work below:* *12 points*

Length of time	Value of deposit
2 months	1,008.16
6 months	1,024.69
1 year, 2 months	1,058.57

$(1+r/12)^{12}=1.05$. Thus, $(1+r/12)=1.05^{1/12}$. Hence, r=4.89%.
Return for 2 months is $(1+r/12)^2$, 6 months $(1+r/12)^6$ and 14 months is $(1+r/12)^{14}$.

Question 2: Determine the interest rate that results in a return of 10% over 1 year with continuous compounding.

The interest rate is r=9.53%

8 points

We must have exp(r)=1.1. Thus, r=ln(1.1)

Question 3: Below is a list of dates and prices of the stock of XYZ cooperation

Date	2/14/2000	2/14/2003	2/14/2006	2/14/2010
Stock Price	24.00	20.12	28.45	39.20
Dividend	none	1.00	2.00	none

12 points

Determine the return of an investor between 2/14/2000 and 2/14/2010 who reinvests all dividends into the stock (*show your work below).*

The return over 10 years is	83	%

To get the same return over 10 years with an investment that has a constant annual return:

The annual return must be	6.2	%

Suppose we start with $24. Then the person will have 39.20, ignoring dividends.
The first dividend will result in 1.00*39.20/20.12=1.95
The second dividend in 2.00*39.20/28.45=2.76.
Thus, the person will have $43.91, i.e., 43.91/24=1.83 gross return.
To get the annual return: $1.83^{1/10}=1.06$

Question 4: Let X_t t=0,1,2,… be a stochastic process. Suppose that $X_{t+1}=2X_t$ with probability p and $X_{t+1}=0.5X_t$ with probability 1-p. Determine the value of p such that X_t is a martingale. *8 points*

p= 1/3

We must have $E[X_{t+1}|X_t]=X_t$. Thus, $2pX_t+0.5(1-p)X_t=X_t$. Thus, $2p+0.5(1-p)=1$. Thus, $p=1/3$

Question 5: Let X_t t=0,1,2,… be a stochastic process. Suppose that $X_{t+1}=X_t+Y_t+10$, where Y_t is independent of X_t. In order for X_t t=0,1,2 to be a martingale, what restrictions must be imposed on Y_t? (*If not restriction is necessary write "none" in the box below).* *8 points*

Expected value of Y_t: -10

Standard Deviation of Y_t: none

Question 6: Suppose you want to determine whether the daily gross return of a stock is correlated with the gross returns from the previous two trading days. These are the first 6 rows of your spreadsheet: *12 points*

	A	B	C	D	E
1	Date	Stock Price	Explanatory variable R_t-2	Explanatory Variable R_t-1	Dependent Variable R_t
2	Feb 1, 2009	31.20	0.9900641	1.000647	1.015852
3	Feb 2, 2009	30.89	1.000647	1.015852	0.9961783
4	Feb 3, 2009	30.91	1.015852	0.9961783	xxxxxxxxxx
5	Feb 6, 2009	31.40	0.9961783	xxxxxxxxxx	xxxxxxxxxx
6	Feb 7, 2009	31.28	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx

Label the columns in your spreadsheet and fill in the appropriate values that you need for the regression. *Clearly specify* which are the dependent and which are the explanatory variables. Write the excel formulae you would use for row 3 in the appropriate boxes below.

3	2/2/09	30.89	=B4/B3	=C4	=D4

Question 7: The spreadsheet below contains information about the consumer price index interest rates and the value of the S&P500 over four years: *20 points*

	A	B	C	D	E	F	G
1	**Date**	**S&P500**	**1 year T-Bill rate**	**Consumer Price Index**	**Yearly Contribution**	**Value if invested in S&P 500**	**Value if invested in T-Bills**
2	2006/01	1363.38	4.94	198.30	1,000	1,000	1,000
3	2007/01	1539.66	4.53	202.42	1020.7766	2150.072909	2070.17660110943
4	2008/01	1378.76	1.83	211.69	1067.524	2992.906521	3231.47955474534
5	2009/01	865.59	0.47	211.14	1064.7504	2943.7068	4355.366008812
6	2010/01	1146.69	0.46	216.64	none	3899.674384	4375.83622905342

Suppose that a person invests 1,000 Dollars in 2006/01 and then increases the amount annually to adjust for inflation until 2009/01. Determine the value of his account every year if (a) the person invests in the S&P500 - column F, and (b) invests in 1 year treasury bills, column G. *Fill in the missing entries in the spreadsheet.*

Question 7: You want to simulate a stochastic process of the form $X_t=R_tX_{t-1}$ where R_t follows a lognormal distribution: The mean of $\ln(R_t)$ is 0.1 and the standard deviation of $\ln(R_t)$ is 0.3. Consider the spreadsheet below. In the first column are random numbers between 0 and 1 that are uniformly distributed (as produced by excel function rand()). *Label and fill in the remaining columns as needed* (you don't need to use all of them) and *fill in the values for X_t.* *20 points*

A table with the cdf of a normal distribution is on the next page.

	A	B	C	D	E	F
1	**Random numbers**	**norminv**	**Exp(B)**			**Stochastic Process X_t**
2						20.40
3	0.25	-0.1023	0.902758683			18.42
4	0.14	-0.2241	0.799235207			14.72
5	0.64	0.2075	1.230597717			18.11
6	0.81	0.3634	1.438211029			26.05
7	0.37	0.0004	1.00040008			26.06

In the boxes below, specify the excel formulae you would use for row 4.

3	0.25	=norminv (a3,0.1,0.3)	=exp(b3)			=f2*c3