TAKE HOME EXAM
Economics of Financial Markets
AY 2020-2021
Summer Session
June 17th - 24th, 2021

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DIRECTIONS

1. The time starts when everybody will have received the exam. You will be told exactly when the time will start.
2. You have ONE FULL WEEK to complete the exam: you are expected to return back your work: the maximum time allowed is the same time you get the paper, exactly one week later.
3. A more detailed set of rules are contained in the file 'Exam Guidelines' which is uploaded on Virtuale on the webpage of this course. I strongly encourage all of you to have a look to that document.
4. State all your assumptions and justify them. Write and show all your work.
5. If you are not able to finish all the exam, do not worry at all. Do all your best, and the best you can.
6. During exam period I am always reachable at `massimiliano.marzo@unibo.it`

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Question 1

Consider data in the dataset included in the file 'data for exam 2021.xls'. This file is divided up into 4 worksheet: i) stocks daily; ii) stocks monthly; iii) funds daily; iv) funds monthly. The worksheet with stocks, include a selection of stocks from the Italian Stock Market starting from January 1st, 2015 until June 14th, 2021. The daily worksheet includes daily prices adjusted for dividends, while the monthly worksheet includes monthly prices for the same sample of securities, adjusted for dividends, starting from Jan 1st, 2015 and ending on June 1st 2021.
The worksheet identified with funds, contains a sample of investment funds sold in the Euro Area and managed by some of the most famous and respected investment firms: both in daily and in monthly frequency, for the same sample size considered also for stocks.

1. Focus first on the two worksheet on stocks. Compute returns for both daily and monthly stocks. Compute mean, standard deviation, variance, skewness and kurtosis for stocks at daily and monthly frequency. Show the results in a table and comment.

2. Compute the variance-covariance matrix and the correlation matrix.

3. Select a sample made of 10-12 securities. You should motivate your choice of securities. The choice can be made, for example, on the basis of the correlation structure of the variance-covariance matrix. Explain and justify your choices.

4. Plot the behavior of the security prices you have chosen, both in daily and monthly frequency during the entire lenght of the sample size.

5. Compute the Mean Variance optimal portfolio allocation for the sample of securities chosen by you both in daily and monthly frequency. Discuss.

6. Compute the same asset allocation after imposing non-negativity constraint on portfolio weights.

7. Given previous results, compute mean, standard deviations, variance, skewness and kurtosis of your optimal mean-variance portfolios, both for daily and monthly frequency. Provide the necessary intuition by making extensive comments.

8. Plot the efficient frontier for both daily and monthly frequency. Discuss.

9. Consider an index representative of the Italian stock market, such as FTSE Italia All Market, given in the two distinct worksheets, one for the daily and one for monthly version. The index is here collected in its Total Return version. Compute all the statistics relative to that index (mean, standard deviation, variance, kurtosis and skewness). Discuss the differences between such statistics for the index and those you found for your portfolio.

10. Compute the beta for each security included in your portfolio and the beta for your portfolio as well.

11. Given a return for a Risk-Free security equal to 0.5 per cent (0.005), compute the Security Market Line (SML)for two (2) securities of your portfolio and for your portfolio as well. Verify for the two chosen securities if the SML is verified., for both daily and monthly frequency.

12. Implement now the Black-Littermann approach for the computation of mean and variance-covariance matrix. You are free to form your own view about the assets. I ask you to form at least 4 views (out of a portfolio of made by 10 securities): two absolute and 2 relative views. You are also free to add additional views. Compute the portfolio allocation conditional to Black Littermann. Compute portfolio statistics (mean, standard deviations, variance, skewness and kurtosis) and Sharpe Ratio,and compare these results with the standard mean-variance case. As a starting point, a benchmark initial asset allocation, you can assume a set of weights corresponding to your *ideal* asset allocation. In designing this exercise, you are free to make all additional assumptions you need to complete the answer. Provide an adequate justification for all the assumptions you are introducing. Do this job for both daily and monthly frequency.

13. Implement a standard Bayesian Asset Allocation. Assume conjugate prior normally distributed and a proper prior for the mean, represented by a normal distribution with a mean equal to the mean of your vector of returns + 1*standard deviation. For the matrix covariance matrix of the prior distribution, you can use a perturbation of the original variance-covariance matrix, multiplied by a factor of 2. Given these assumptions:

    - Compute mean and standard deviation for the standard bayesian model. (Hints: follow slides).
    - Compute asset allocation of portfolio. Compute statistics of bayesian portfolio: mean, mean, standard deviations, variance, skewness and kurtosis and Sharpe Ratio.
    - Discuss your results by comparing them with the results obtained in previous cases.

    Do this job for both daily and monthly frequency.

14. Compute Global Minimum Portfolio Variance, and its statistics (mean, standard deviations, variance, skewness and kurtosis) and the Sharpe Ratio, for daily and monthly data.

15. Given the differences existing between the asset allocation of all the portfolio obtained under different assumptions, discuss what are the potential explanation about the differences in asset allocation and discuss a possible way to improve upon all such results by considering, for example a linear combination of all such portfolio. For example, assign a 0.25 weight to each of the four portfolio obtained (Mean Variance, Black Littermann, Pure Bayesian, Global Minimum Variance). What are going to be the properties of the resulting portfolio in terms of its statistics (mean, standard deviations, variance, skewness and kurtosis) and the Sharpe Ratio ? Discuss extensively.

Question 2

The backgound reading to answer this question is given by: Bansal, R. and A. Yaron, (2004), "Risks for the Long Run: A Potential Resolution of Asset Pricing Puzzles ", *Journal of Finance*. This means that all of you should take this paper as a reference, since almost all the following papers represent an elaboration on the same theme proposed by Bansal and Yaron (2004): make sure you can follow their line of reasoning.
Next, the set of papers is given by the following list. Each number in the list identifies that specific paper.

1. Bansal, R., and I. Shaliastovich, (2013), "A Long-Run Risks Explanation of Predictability Puzzles in Bond and Currency Markets", *The Review of Financial Studies* , January 2013, Vol. 26, No. 1.

2. Bansal, R., Kiku, D., and M. Ochoa, (2016), "Price of Long-Run Temperature Shifts in Capital Markets", NBER Working Paper N. 22529, August 2016.

3. Bansal, R., Kiku, D., and M. Ochoa, (2019), "Climate Change Risk", *mimeo*, August 2016.

4. Campbell, J., Y., and L.M. Viceira, (1999), "Consumption and Portfolio Decisions When Expected Returns Are Time Varying ", *Quarterly Journal of Economics*, Vol. 114, No.2, pp. 433-495.

5. Chan, Y.,L., and L.M. Viceira, (2000), "Asset Allocation with Endogenous Labor Income: The Case of Incomplete Markets", *mimeo*, December.

6. Chen, H., Ju, N., and J.Miao, (2014), "Dynamic Asset Allocation with Ambiguous Return Predictability ", *Review of Economic Dynamics*, Vol. 17, No. 4, 799-823.

7. Eraker, B., Shaliastovich, I., and W. Wang, (2015), "Durable Goods, Inflation Risk, and Equilibrium Asset Prices", *mimeo*, January.

8. Miller, M., Paron, J.,D., and J.A. Wachter, (2021), "Sovereign Default and the decline in interest rates ", *mimeo*, April.

9. Viceira, L.,M., (2001), "Optimal Portfolio Choice for Long-Horizon Investors with Nontradable Labor Income", *Journal of Finance*, Vol. 61, No.2, April.

10. Yang, W., (2011), "Long Run Risk in Durable Consumption", *Journal of Financial Economics*, Vol. 102, 45-61.

As you know, each group of students will be assigned with one of the previously quoted papers. The distribution of the paper allocated for each group is as follows:

- Group 1. Roberto Zabatta, Oliviero Chiaramonti: Paper No.1.
- Group 2. Solidea Cherchi, Silvia Pancaldi: Paper No.2.
- Group 3. Francesca Giustino, Margherita Gaddini: Paper No.3.
- Group 4*. Beniamino Sartini, Mauro Martis, Orazio Terranova: Paper No.4.
- Group 5. Ahmad El Moussaoui, Cristian Mantia: Paper No.5.
- Group 6. Valentina Calvarano, Ilaria Bertolino: Paper No.6.
- Group 7. Matteo Barbieri, Marco De Bortoli: Paper No.7.
- Group 8. Fabiana Liu, Alessandra Alunni: Paper No.8.
- Group 9. Matteo Morolli, Marco Lombardi: Paper No.9.
- Group 10. Giacomo Pierucci, Federico Rubino: Paper No. 10.
- Group 11. Francesca Lotti, Riccardo Lamia: Paper No.1.
- Group 12. Di Francia, Genna: Paper No.2.
- Group 13. Riccardo Pauselli, Riccardo Luiso: Paper No.3.
- Group 14. Giorgio Bongermino, Roberto Cesa: Paper No.4.
- Group 15. Simone Menaldo, Edoardo Misantoni: Paper No.5.
- Group 16. Vincenzo Pascucci, Quan Liu: Paper No.6.
- Group 17. Giovanni Migliorini, Mattia Mason: Paper No.7.
- Group 18. Andrea Lo Giudice, Leonardo Marconi: Paper No.8.
- Group 19. Fantini Francesco, Mazzoni Alberto: Paper No.9.
- Group 20. Ecaterina Clipa, Fabio Colpo: Paper No.10.
- Group 21. Riccardo Drago, Lorenzo Lambertini: Paper No.1.
- Group 22. Andrea Pigoli, Marco Parigi: Paper No.2.
- Group 23. Yuan Huang: Paper No.3.
- Group 24. Tommaso Burresi, Luca Rusticelli: Paper No.4.
- Group 25. Francesco Gravili, Andrea Bartolucci: Paper No.5.
- Group 26. Michele Silano: Paper No.6.

- Group 27. Kossir El Mehdi, Shamal Karunanayakage: Paper No.7.

All papers have an empirical parts: you are NOT requested to replicate the empirical part. You are only requested to replicate the analytical aspects together with a thorough discussion about the intuition the paper's results.
Please, do your job in group, separately from colleagues in other groups sharing the same paper. By doing so, you will help other people and you will not have any chances to better differentiate your ability to me (and to yourself !).

Therefore: DO NOT SPLIT YOUR WORK WITH PEOPLE IN OTHER GROUP HAVING THE SAME PAPER !

The exam is yours.

Additional Question for Group 4

THIS QUESTION IS ONLY FOR GROUP 4.
Consider again data in the dataset included in the file 'data for exam 2021.xls' and concentrate your attention on the two worksheet on funds (monthly and daily).

1. Compute returns for both daily and monthly funds included in the worksheet. Compute mean, standard deviation, variance, skewness and kurtosis for stocks at daily and monthly frequency. Show the results in a table and comment.

2. Select a sample of minimum 7 and maximum 10 funds, by adopting a specific criterion which takes into account i) management style; ii) investment focus; iii) potential diversification.

3. Compute the variance-covariance matrix and the correlation matrix of the selected sample of funds.

4. Plot the behavior of the fund prices you have chosen, both in daily and monthly frequency during the entire length of the sample size.

5. Compute the Mean Variance optimal portfolio allocation for the sample of funds chosen by you both in daily and monthly frequency. Discuss.

6. Compute the same asset allocation after imposing non-negativity constraint on portfolio weights.

7. Given previous results, compute mean, standard deviations, variance, skewness and kurtosis of your optimal mean-variance portfolios, both for daily and monthly frequency. Provide the necessary intuition by making extensive comments.

8. Plot the efficient frontier for both daily and monthly frequency. Discuss.

Evaluation Form for your classmate

Please answer the following questions by sending to me an email at `massimiliano.marzo@unibo.it`*. I will be the only reader of your answers. Make sure you respond to me without sharing your comments with the component(s) of your group. With these questions each of you will evaluate the collaboration and the effort of each group member. Thank you very much.*

1. Who are your group components ?
2. Whose effort component are evaluating with these comments ?
3. Did your colleagues have worked with a cooperative spirit, enhancing discussion with a proactive and constructive behavior during exam preparation ? Explain.
4. Did the task have been equally split among all group's component ?
5. How would you judge the effort and the work realized by group component (write a judgement separate for each group component).
6. Add any other observations you might consider to be relevant