**Problem Set 1**

Due Monday, January 28, 2019, before 11:59pm

*Instructions*: This is a group assignment. The size of your group must be less than or equal to 3 students. The memberships of groups may change for different homework assignments. Some assignments will be individual assignments.

*I suggest that you submit your computations in the form of an Excel file via COMPASS. Because you can enter text into an Excel file, add labels to the file, format it for readability, etc., I think it makes sense put your entire solution into the Excel file, and submit just a single Excel file. I also add the following suggestions:*

*(a) Only submit one assignment per group but make it very clear who the group members are.*

*(b) The file name should be: PSn.FAMILYNAME1Initial1\_FAMILYNAME2Initial2….xls,*

*for example my solution to Problem set 1 would have the file name PS1.WIDDICKSM.xls.*

*(c) Please make sure that your Excel file is well-organized and clear, with appropriate text, explanations, and formatting. If I cannot figure out what you did, then what you did is wrong.*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task .** (15 points)

1. **Estimate the value of the Buffered Performance Leveraged Upside Securities (PLUS) on its date of issuance, based on the Value of the S&P 500 Index due February 12, 2020, described in detail in the pricing supplement at:**

[**https://www.sec.gov/Archives/edgar/data/895421/000095010319000469/dp100786\_424b2-ps1443.htm**](https://www.sec.gov/Archives/edgar/data/895421/000095010319000469/dp100786_424b2-ps1443.htm)

1. **Make brief notes about any assumptions you have made and any concerns about your data.**
2. **If the value of the S&P on 2/7/2020 is 2765.334 and on 2/12/2020 is 2840.752, calculate the actual realized return for an investor who agreed to purchase these notes for $10 on January 7, 2019. With hindsight, was it a good investment?**

Notes

These notes were marketed and priced on January 7, 2019, on which date the S&P 500 index closed at 2,513.94 but payment is made on January 10, 2019. The notes mature on February 12, 2020; however, the maturity date payment is based on the index closing value on February 7, 2020, the valuation date.

Also, please recognize that the payment is based on the reported index value, which **does not include** the reinvestment of any dividends paid by the portfolio underlying the index. That is, you must be careful to include a dividend yield in your calculation of the option price.

Necessary data (option implied volatilities, dividend yields and interest rates) should be obtained from Bloomberg – additional instructions/notes are provided on the PS1\_Bloomberg\_help file available on COMPASS. I can also answer questions via email.

**If you do not yet have access to COMPASS, please send me your NetID and I can manually add you.**

*Hints: You should be able to value this product by only considering European options, which you can value using the Black-Scholes formula. Convert the returns into values of the S&P500 and then determine the option positions required to recreate the payoff of the PLUS as I showed you in Lecture 1.*

*To value the options you will need the* ***implied volatilities*** *of the contracts. These are available only for certain maturities and strike prices and so you may need to interpolate to find an appropriate one for your options. Implied volatility typically varies over strike and maturity so you will need to try to match both.*

*Additionally, you will also need the* ***dividend yields****, and* ***risk-free rates*** *for different periods, you may also need to interpolate these for different maturities.*

*Good luck!*

Additional Information:

If you are curious about other issues of structured products, the pricing supplements are available from the SEC’s EDGAR database. Go to <http://www.sec.gov/edgar/searchedgar/webusers.htm>, click the first bullet to search by “Company or fund name….”, and then enter the issuer name, for example “Morgan Stanley.” Morgan Stanley and various subsidiaries will be displayed. You will have to figure out which one you want (if you enter “Morgan Stanley,” the one that appears first is the one you want). Then for “Filing Type,” enter 424B2, because the pricing supplements that describe the structured products are “Form 424B2.”[[1]](#footnote-1)

Later on in the class we will consider other structured products – for example, you may be interested in:

https://www.sec.gov/Archives/edgar/data/895421/000095010318001463/dp86246\_424b2-ps124.htm

1. For some other issuers they might be Form 424B3 or Form 424B5. [↑](#footnote-ref-1)