Group A About Matrix Pricer design

Michael Wang · 12/2/18

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M

Michael Wang

Joined:	9/9/18
Messages:	47
Points:	278

12/2/18 #1

I just want to confirm my idea about A1.d:
We need to input several vectors such as vector r, vector T, vector S, vector sig, vector K.
And we turn these vectors into a parameter matrix like:

r1, T1, S1, sig1, K1;
r2, T2, S2, sig2, K2;
......
rn, Tn, Sn, sign, Kn;

And we apply each row to the BS formula and get a vector of option price?
Is that correct? @APalley @GONG CHEN

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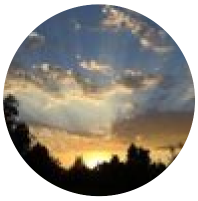

GONG CHEN

Joined:	9/11/15
Messages:	3,799
Points:	523

12/2/18 #2

> Michael Wang said:
>
> I just want to confirm my idea about A1.d:
> We need to input several vectors such as vector r, vector T, vector S, vector sig, vector K.
> And we turn these vectors into a parameter matrix like:
>
> Click to expand...

The Pricer function should accept a matrix, and how you populate the matrix is for you to decide.

For the purpose of this exercise, the matrix can simply just have one colum wit different values(e.g. T=1,2,3,...., and same r,s,sig,K for all rows), so if you just want to create such matrix, it may not be necessary to input 5 vectors

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Michael Wang and APalley

M

meiruiw

Joined:	10/27/20
Messages:	32
Points:	268

2/13/21 #3

> The Pricer function should accept a matrix, and how you populate the matrix is for you to decide.

Hi, I have a few confusions regarding the requirement. Can you please check my understanding below?

1. Based on this quote, is it ok if I have a MatrixPricer class with methods/member functions for the user to populate this matrix and a Pricer member function that accept this matrix and output a vector of prices (instead of accepting a matrix in the MatrixPricer's constructor)?

2. When you say that the Pricer function should accept a matrix, are you referring to a "vector<vector<double>>" object, and then inside the Pricer function, create a temporary Option object for each row of parameters and call its Pricer function?

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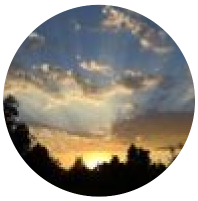

GONG CHEN

Joined:	9/11/15
Messages:	3,799
Points:	523

2/13/21 #4

> meiruiw said:
>
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>
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Yes to both.

Report Like Reply

M

meiruiw

Joined:	10/27/20

2/14/21 #5

> GONG CHEN said:
>
> Yes to both.

Thank you for the confirmation. Can I ask a further questions about the design?

Currently I implement my MatrixPricer class as a template to use different

Messages: 32
Points: 268

option classes' price function. However, I read from other threads that our code should be able to handle situations where the matrix can have different options for each row, and template seems to prohibit this function.

If template does not work, I'm not sure how to implement this function with the current tools we've learned. Can you please provide some hints/suggestion?

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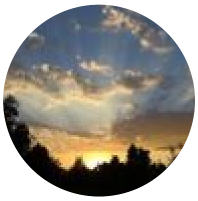

GONG CHEN

Joined: 9/11/15
Messages: 3,799
Points: 523

2/14/21 #6

> meiruiw said:
>
> Thank you for the confirmation. Can I ask a further questions about the design?
>
> Currently I implement my MatrixPricer class as a template to use different option classes' price function. However, I read from other threads that our code should be able to handle situations where the matrix can have different options for each row, and template seems to prohibit this function.
>
> If template does not work, I'm not sure how to implement this function with the current

See if polymorphism or passing in additional function arguments helps. But if nothing works for you, it's also fine to assume the whole matrix is for one type of Option with e.g. increasing S.

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M

meiruiw

Joined: 10/27/20
Messages: 32
Points: 268

2/14/21 #7

> GONG CHEN said:
>
> See if polymorphism or passing in additional function arguments helps. But if nothing works for you, it's also fine to assume the whole matrix is for one type of Option with e.g. increasing S.

Thank you for your timely response. Just to confirm, I won't have points on flexibility deducted because I assume that the whole matrix is for one type of option right?

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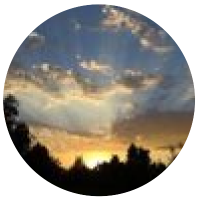

GONG CHEN

Joined: 9/11/15
Messages: 3,799
Points: 523

2/14/21 #8

> meiruiw said:
>
> Thank you for your timely response. Just to confirm, I won't have points on flexibility deducted because I assume that the whole matrix is for one type of option right?

Yes, per instruction, every row in the matrix has the same values, except one col with increasing S/T/sig..., but your classes/functions should be able to handle both European and American options.

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M

meiruiw

Joined:	10/27/20
Messages:	32
Points:	268

2/14/21 #9

> GONG CHEN said:
>
> Yes, per instruction, every row in the matrix has the same values, except one col with increasing S/T/sig..., but your classes/functions should be able to handle both European and American options.

Thank you for the clarification. Sorry I have another question. Do we have to use the **make_vector(start, end, h)** function in part (c) to create the matrix in part (d) Matrix Pricer?

I have this concern because , in my implementation, I have the client populate the matrix by adding rows(vectors of parameters + enum for option class). Is this a flexible enough design? Or shall I add a constructor that takes in the start, end, h, parameter to change etc. and create a matrix accordingly.

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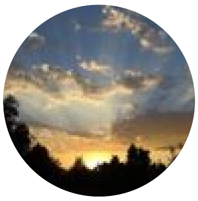

GONG CHEN

Joined:	9/11/15
Messages:	3,799
Points:	523

2/14/21 #10

> meiruiw said:
>
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How to populate the matrix is up to you decide — depends on your design, (start, end, h) may or may not suit your need. You may also comment on your final approach to justify your choice.

> meiruiw said:
>
> I have this concern because , in my implementation, I have the client populate the matrix by adding rows(vectors of parameters + enum for option class).

Do you mean taking values from user inputs?

Report Like Reply

M

meiruiw

Joined:	10/27/20
Messages:	32

2/14/21 #11

> GONG CHEN said:
>
> How to populate the matrix is up to you decide — depends on your design, (start, end, h) may or may not suit your need. You may also comment on your final approach to justify your choice.
>
> Do you mean taking values from user inputs?

Points: 268

Yes, I have an addOption member function that accepts vector<double> created by the user and add this as a row to my matrix

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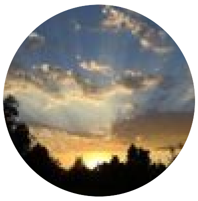

GONG CHEN

Joined: 9/11/15
Messages: 3,799
Points: 523

2/14/21 #12

> meiruiw said:
>
> Yes, I have an addOption member function that accepts vector<double> created by the user and add this as a row to my matrix

OK, but just make sure if the matrix is, e.g. 100 x 10, the user won't have to input 1000 values.

Report Like Reply

M

meiruiw

Joined: 10/27/20
Messages: 32
Points: 268

2/14/21 #13

> GONG CHEN said:
>
> OK, but just make sure if the matrix is, e.g. 100 x 10, the user won't have to input 1000 values.

Thank you for the feedback! I will keep my current implementation for the class’s flexibility but add a constructor that fits closer to the instruction and is more user-friendly.

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GONG CHEN

E

eddieeddie

Joined: 4/1/23
Messages: 27
Points: 103

1/19/24 New #14

@APalley
After reading some posts, would the following approach for c) and d) make sense:
Create separate class EuroOptionVec with member vector of EuroOption Pointer, then create member function to adjust value within EuroOption in the vector. Then create VecPricer for the price of all EuroOption in the vector..

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A

APalley

Joined: 12/10/09
Messages: 52,327
Points: 1,273

1/19/24 New #15

That would not fit within the requirement to create a 'mesh' of parameters

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eddieeddie

Joined: 4/1/23
Messages: 27
Points: 103

1/19/24 New #16

@APalley, thank you for clarification.

Would the following fits in the req:
create global function create mesh parameters.
create EuroOptionMat class with member vector of vector of doubles to store the created mesh parameters.
then calc price by create individual EuroOption class for each row of para and call the pricer..

If this approach make sense, my question is how polymorphism plays a role here..

Last edited: 1/19/24

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APalley

Joined: 12/10/09
Messages: 52,327
Points: 1,273

1/20/24 New #17

> eddieeddie said:
>
> @APalley, thank you for clarification.
>
> Would the following fits in the req:
> create global function create mesh parameters.
> create EuroOptionMat class with member vector of vector of doubles to store the created mesh parameters.
> then calc price by create individual EuroOption class for each row of para and call the pricer..

That sounds on the right track.

Think in terms of multiple potential option types

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eddieeddie

eddieeddie

Joined: 4/1/23
Messages: 27
Points: 103

1/21/24 New #18

@APalley,
As I am progressing on d) where new option type needs to be created, i would like to change my prev design to the following:

propose design: Option class as base class, AmericanOption class and EuroOption class as derive class; no member saved, member function price takes input of vector of paras. Global function to run through each row of matrix paras and pass paras to Option class with if statements distinguish AmericanOption or EuroOption, call the pricer via Polymorphismn.

Would this design sounds on the right track (better than prev)?

Last edited: 1/21/24

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A

APalley

Joined:	12/10/09
Messages:	52,327
Points:	1,273

1/21/24 New #19

> eddieeddie said:
>
> @APalley,
> As I am progressing on d) where new option type needs to be created, i would like to change my prev design to the following:
>
> propose design: Option class as base class, AmericanOption class and EuroOption class as derive class; no member saved, member function price takes input of vector of paras. Global function to run through each row of matrix paras and pass paras to Option class with if statements distinguish AmericanOption or EuroOption, call the pricer via

You will be graded on your design decisions and justification of it; hence, we cannot comment here much on the optimal design.

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eddieeddie

F

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