**[Farah](https://zenalyticsorg.slack.com/team/U98615V44" \t "_blank)**[11 h 51](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037500000009)

If I understood well, machine learning methods such as polynomial regression or Gaussian regression are used for estimating the continuation value inside the Monte Carlo simulations

[**kwang**](https://zenalyticsorg.slack.com/team/U6FKL22AC)[11 h 51](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037518000095)

yes that's what I meant

[11 h 52](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037536000040)

you could also directly learn to estimate without MC

[11 h 52](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037551000212)

but the problem here is that you need enough training data

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Exactly

[**kwang**](https://zenalyticsorg.slack.com/team/U6FKL22AC)[11 h 53](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037581000085)

which might be possible for american options, but not possible for gas storages

[11 h 54](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037643000329)

there are only a few gas storages with daily data

[11 h 54](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519037673000411)

and each storage is potentially different, so that you can't use data from storage 1 to apply to storage 2

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I see

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MC works because we know the Markov rule, so that it becomes an optimization problem rather than prediction problem

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LSMC is used to generate the forward curve for gas storage, right? Then using these prices we optimize the storage of gas

not exactly, forward curves are generated using normal MC following the corresponding SDEs

[12 h](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038043000327)

LSMC is to use estimation functions to approximate the real target function we are interested in

[12 h 01](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038066000130)

in american option case, that's the value of the forward american options, and also the exercise actions

[12 h 02](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038125000299)

for gas storage, it's the level of forward gas storage, the quantity of the instruments we trade, and also the actions taken at each time step, which is the amount of gas injected or withdrawn

[12 h 04](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038291000297)

Because the whole process is Markovian, the decisions made at each time step must be some kind of function of the known states (such as prices, gas storage levels) as of that time step

[12 h 05](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038317000097)

LSMC uses a regression function estimate that unknown function, that's the idea

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There is something that I didn't understand

[12 h 12](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038725000355)

For American option, for LSMC we are estimating the continuation value using the linear regression (using the known function for American options Stock\_price-Strike to get the coefficients of the polynomial)

[12 h 12](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038758000305)

but for gas storage this function is unknown?

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for gas storage it's also known

[12 h 13](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038808000348)

but both functions are one step relationship

[12 h 14](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038844000308)

the value of the american option at this step depends on the value of american options on the next step

[12 h 15](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519038923000106)

the regression removes this dependency, so that the value of the american option at this step is only a function of the price at this time step (and strike, discount rate etc)

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Yes

[12 h 20](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039222000227)

But what is the known function for gas storage? For American options it's clear

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oh I see your question. I will send you a paper which has it

[12 h 21](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039284000135)

it's a similar recursion relation

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Understood

[**kwang**](https://zenalyticsorg.slack.com/team/U6FKL22AC)[12 h 25](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039533000099)

just sent you

[**Farah**](https://zenalyticsorg.slack.com/team/U98615V44)[12 h 26](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039591000339)

Got it! Thanks a lot !!

[**kwang**](https://zenalyticsorg.slack.com/team/U6FKL22AC)[12 h 26](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039598000293)

No problem

[12 h 27](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039626000300)

Note that paper assumes spot contracts, but you can derive similar stuff assume other kind of instruments

[12 h 27](https://zenalyticsorg.slack.com/archives/D99291QS2/p1519039666000164)