

MCarloRisk3D app

training slide set 15

Stochastic volatility parameter scan intro

September, 2020 (updated October 29, 2023)

V1.1

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diffent.com

Availability

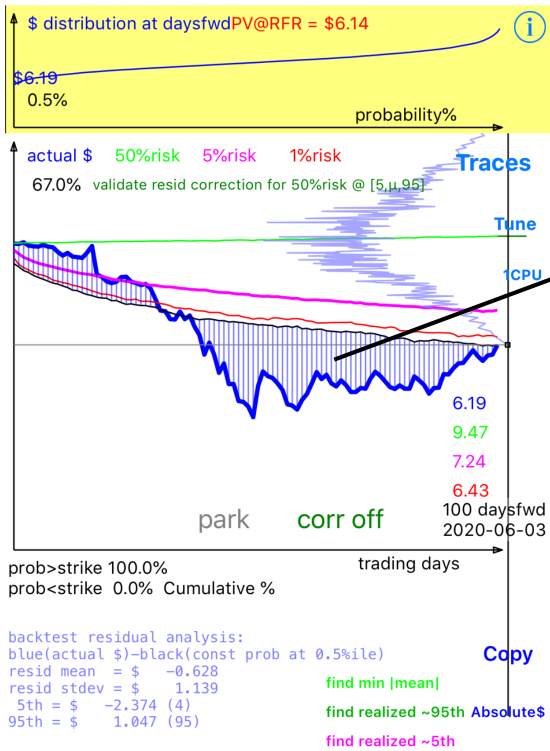
- Mean shift / drift correction: iPhone, iPad, Mac versions
- Volatility / diffusion correction: iPhone, iPad
 - (soon available on Mac)
- app name: MCarloRisk (iPhone)
- app name: MCarloRisk3D (iPad and Mac)

Predictor-Corrector method

- Inspired by these types of methods:
 - https://en.wikipedia.org/wiki/Predictor-corrector_method
- 1. **Predict** forward into a withheld data window of time (e.g. bulk backtest).
- 2. Do an exhaustive validate by stepping back this bulk backtest one day at time.
- 3. Collect the residuals from this exhaustive validation step.
- 4. Use these residuals to **correct** or adjust the prediction made in step 1.
- 5. Re-validate the model to check results.
- 6. If ok, use the corrected model to forward forecast.

By example: First, we Predict.

Set up a default 100 day backtest. In this case we are studying symbol F.



clearly in recent times, actual (time, price) behavior went outside the envelope forecast by the Monte Carlo method

Next, we go to the Validate tab to exhaustively validate this model.

Validate Plot days to withhold 100

we will just leave this at default 100 days

also Validate MultipleRegression

Val versus r1zd 50th 50%-5% 5%r1zd

Switch on the new Predictor-Corrector feature

Pred-corr feedback loop sum(mean of prior validate resid) \$ 0

iteration

Rolling window Validation may be time consuming. The Monte Carlo you have set up on the Monte Carlo tab will run once per with-held data point.

Reminder: this will take our bulk backtest from prior slide and step it back 1 day at a time, for 100 additional days backwards

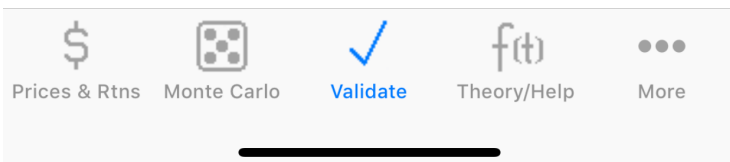
SelectAll filter Beta Stability Plot

MultipleRegression Validate and "Validate versus realized 50th %ile" are somewhat more time consuming.

It will record the results at each step back.

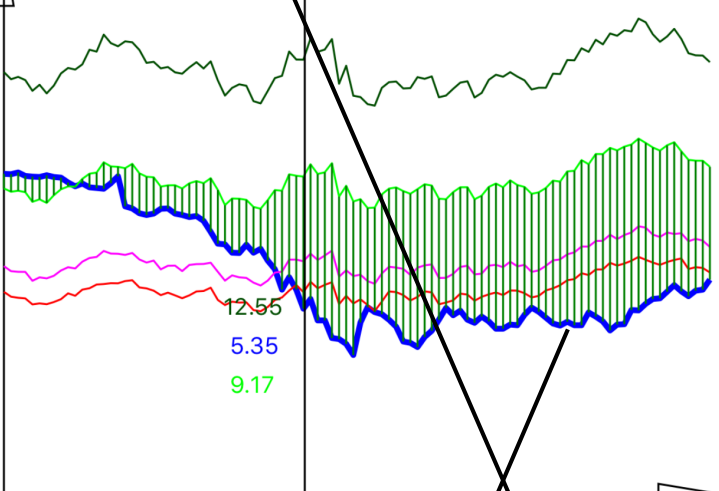
%ile is an abbrev for "percentile"

Press Validate to kick off the process.



Validate Report days to withhold 100

actual \$ 95%ile 50%risk 50%rlzd 5%rlzd 5%risk 1%risk



12.55
5.35
9.17

6.72
5.83
recent days withheld

validation residual analysis:
 blue(actual) - bright_green(50%ile)
 resid mean = \$ -2.712
 resid stdev = \$ 1.800
 5th = \$ -4.273 (4)
 95th = \$ 0.470 (95)

1x linear

First iteration validate results

50th percentile forecast in bright green
 Large residuals* (errors) dark green
 this suggests that the model Validates poorly

Reality (blue)

statistics of residuals if you are interested

you don't need to think too much about this yet,
 we will apply the residuals
 automatically in the next step

reality drops
 way below red 1st percentile
 curve
 for many days

Press Report to go to next step

* Reminder: residuals in this step are defined as
 actual price (blue) minus
 the 50th percentile predicted value
 (bright green)

Validate Plot days to withhold 100

also Validate MultipleRegression

Val versus Rzd 50th 50%-5% 5%rlzd

Pred-corr feedback loop sum(mean of prior validate resid) \$ 0.000000

Iteration 1

Rolling window / heteroskedastic validation.

Checks for the past 100 days at the following percentiles:

Model	Actual	Count	AcceptRange
95%	100.0%	100	[91,98]
95th perc from model is too high			
50%	87.0%	87	[47,58]

SelectAll filter Beta Stability Plot

MultipleRegression not validated

After pressing Report, we see this:

0.0 indicating we have not yet applied a correction

indicating we have already done 1 iteration

Press Validate again, to do the next iteration.

The dark green residuals from prior screen will be applied as a "correction" to the model we previously validated.

The precise type of correction applied will be discussed in later slides.

Validate Plot days to withhold 100

also Validate MultipleRegression
 Val versus rlzd 50th 50%-5% 5%rlzd
 Pred-corr feedback loop sum(mean of prior validate resids) \$ -2.711722
 iteration 2

Now we see this. Correction applied was **-\$2.71**

2nd time thru

Rolling window / heteroskedastic validation.

Checks for the past 100 days at the following percentiles:

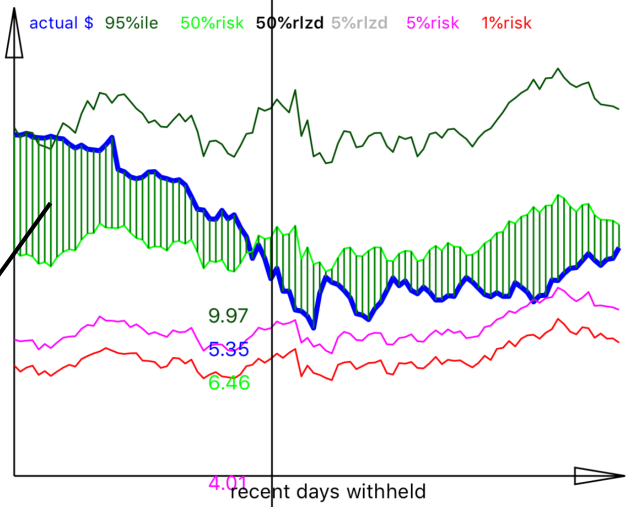
Model	Actual	Count	AcceptRange
95%	96.0%	96	[91,98]
reasonable model of 95% risk level			
50%	61.0%	61	[42,58]

SelectAll filter Beta Stability Plot

MultipleRegression not validated

Press Plot button to see the Validate Plot.

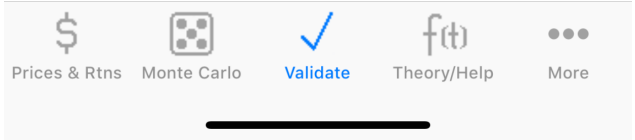
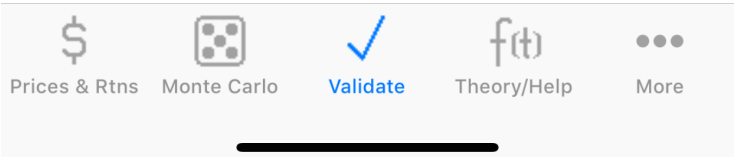
Validate Report days to withhold 100



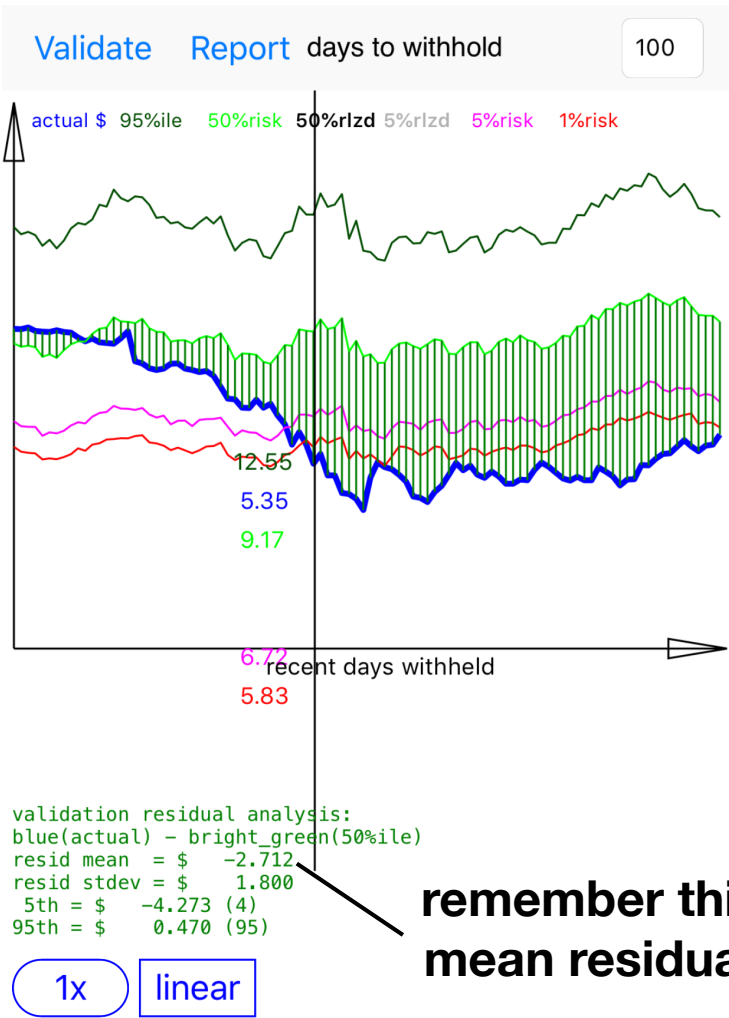
validation residual analysis:
 blue(actual) - bright_green(50%ile)
 resid mean = \$ 0.005
 resid stdev = \$ 1.798
 5th = \$ -2.252 (4)
 95th = \$ 3.273 (95)

1x linear

Let's compare to prior.



First iteration



remember this number
mean residual = -\$2.71

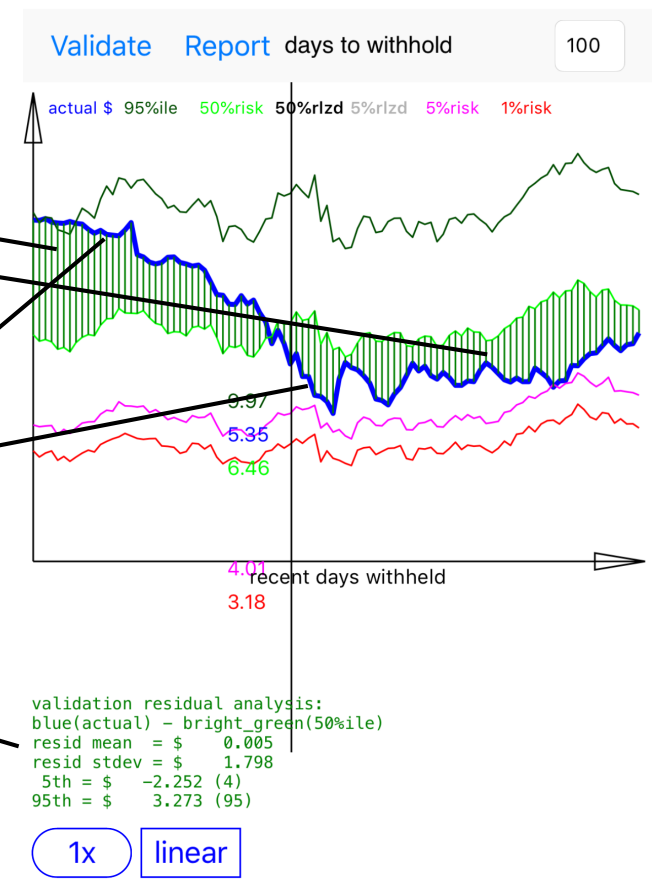
this is the correction we applied

Second iteration, correction applied

residuals now more evenly distributed over/under actual blue curve

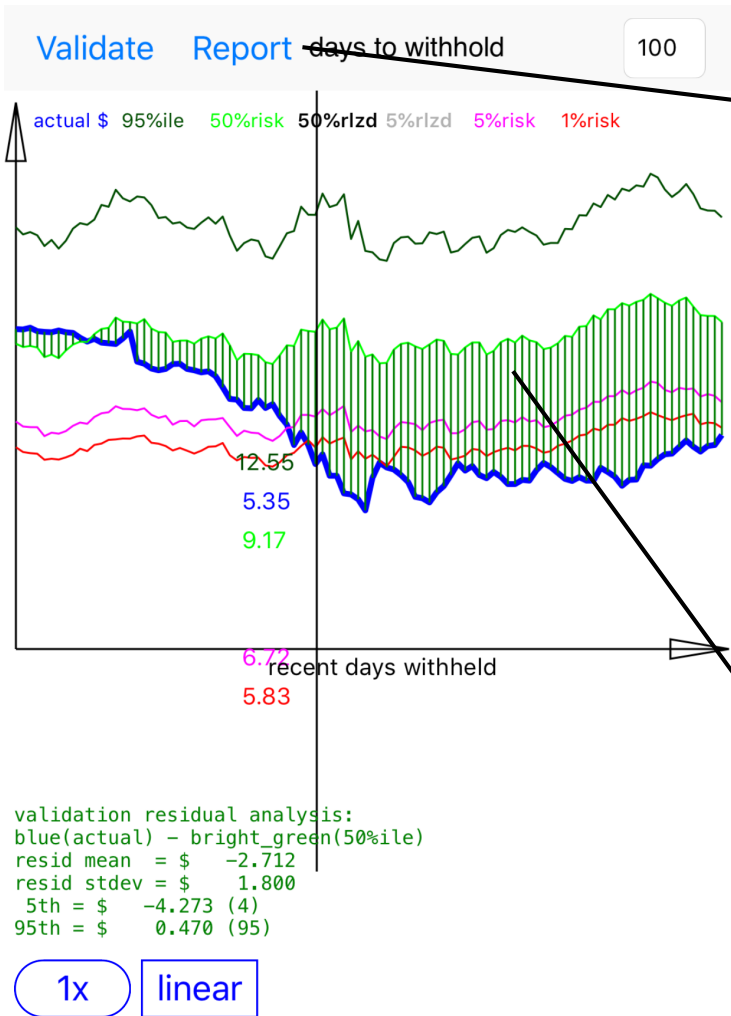
range of blue curve is now almost fully within 5th/95th percentile bands

mean residual is now almost 0



Now we can apply this correction to the most recent bulk backtest

Reminder

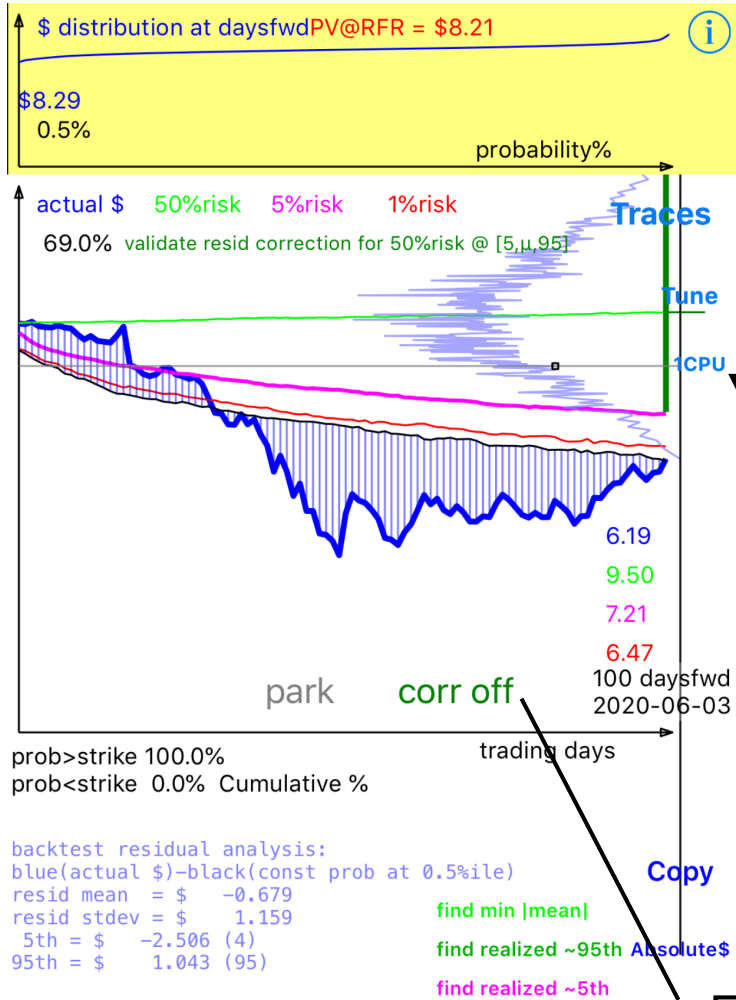


You can press the Report button to see a more detailed metrics report of how well your validation hit a variety of interesting targets: 50th percentile, 5th percentile, etc.

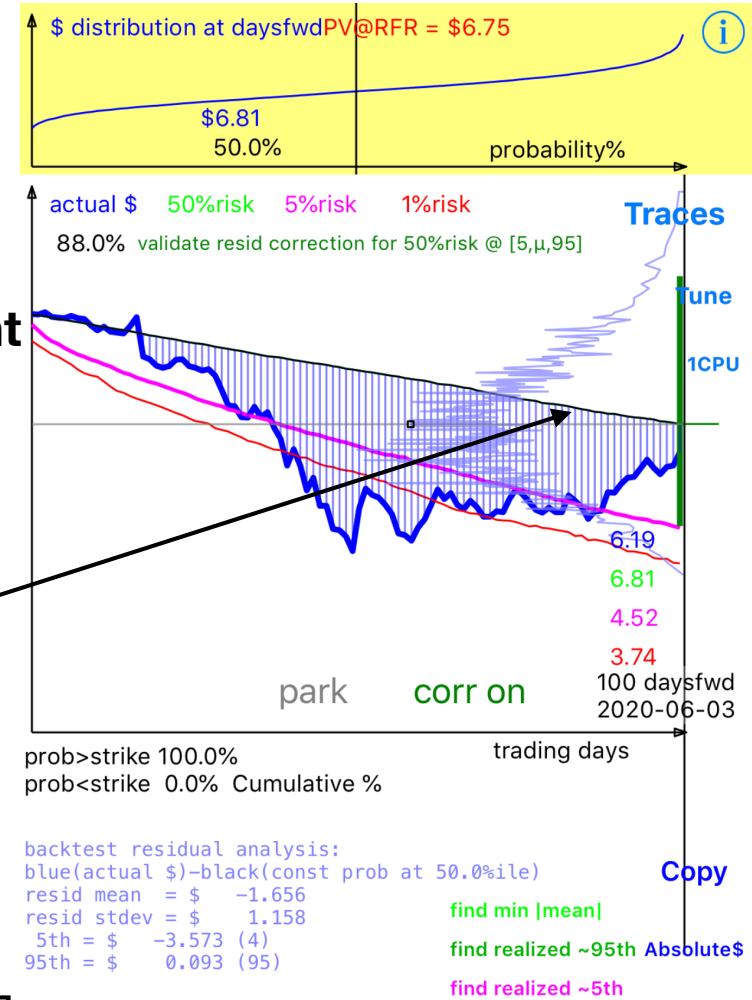
You can check the uncorrected and the corrected results in the Report.

The Report just encapsulates what you see in this Plot a little more quantitatively.

correction not applied



correction applied

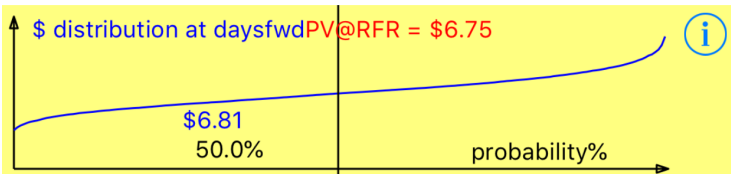


mean (bright green)
of forecast at end point
will be shifted by the
correction
-\$2.71

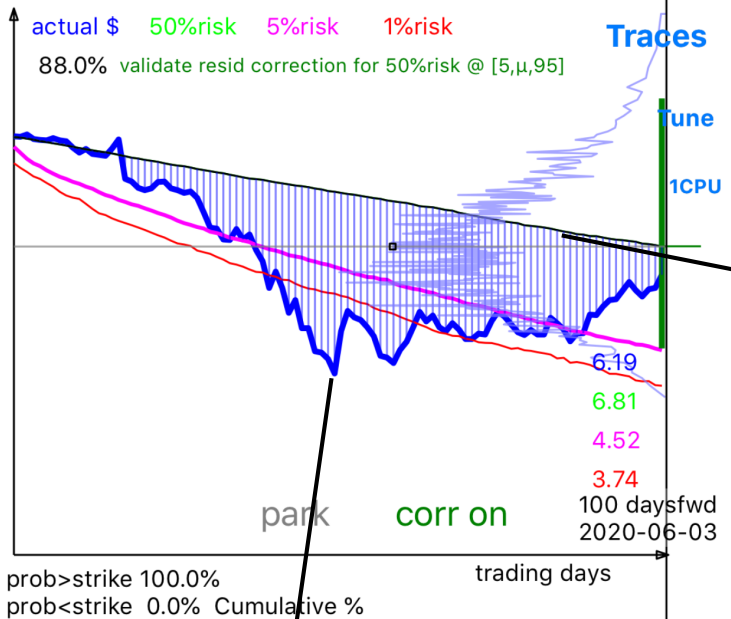
to yield this

by default, we do not
apply the correction

tap this button to apply
the correction



The mean shift correction is applied on the right side of the forecast envelope (most recent, widest).



The whole price/probability distribution is shifted down by that amount on the right side.

Then the correction is applied as an additional linear (in time) "drift" term applied to older slices of the forecast envelope.

Each day back, the entire probability distribution is mean-shifted by the correction amount, adjusted linearly by time.

Since this envelope is 100 days long in this example, the additional drift (drift correction) is $-\$2.71/100 = -\0.021 per day

E.g.

day 1 of forecast, add -2.1 cents of drift
 day 2 of forecast, add -4.2 cents of drift
 etc

envelope captures more of the actual behavior but model still needs some work

```
backtest residual analysis:
blue(actual $)-black(const prob at 50.0%ile)
resid mean = $ -1.65
resid stdev = $ 1.158
5th = $ -3.573 (4)
95th = $ 0.093 (95)

find min |mean|
find realized ~95th Absolute$
find realized ~5th
```


Notes

- When we switch between **corr on** / **corr off**, the monte carlo model is re-generated. Hence if you have low-ish values for the monte carlo run count, results may differ slightly between runs due to randomness in the MC process.
- For example, our 50th percentile value uncorrected was \$9.50. Applying correction of $-\$2.71 = \6.79
- However, our graph indicates that corrected 50th percentile value is \$6.81 (off by a couple of cents).
- This discrepancy should go away if you use higher monte carlo run counts.

monte carlo run count

Run MC 5000 100 days withhd days fwd 100

49 skip large returns > % 2.4 RFR% days backwd to sample 252

last known price:
\$ 9.26

Plot

Validate Plot days to withhold 100

also Validate MultipleRegression

Val versus rlzd 50th 50%-5% 5%rlzd

Pred-corr feedback loop sum(mean of prior validate resid) \$ -2.711722

iteration 2

To clear the correction process

Rolling window / heteroskedastic validation.

Checks for the past 100 days at the following percentiles:






Model	Actual	Count	AcceptRange
95%	96.0%	96	[91,98]
reasonable model of 95% risk level			
50%	61.0%	61	[42,58]

SelectAll filter Beta Stability Plot

MultipleRegression not validated

Press the x to clear correction and start over.

E.g. if you are changing to a different stock, or changing model parameters.

 Prices & Rtms
  Monte Carlo
  **Validate**
 Theory/Help
  More

Forecasting

- Now that we have a drift correction factor based upon longer term backtests, we can forecast forward.
- Set **days withheld** to 0 per normal procedures in this app then re-run the monte carlo.

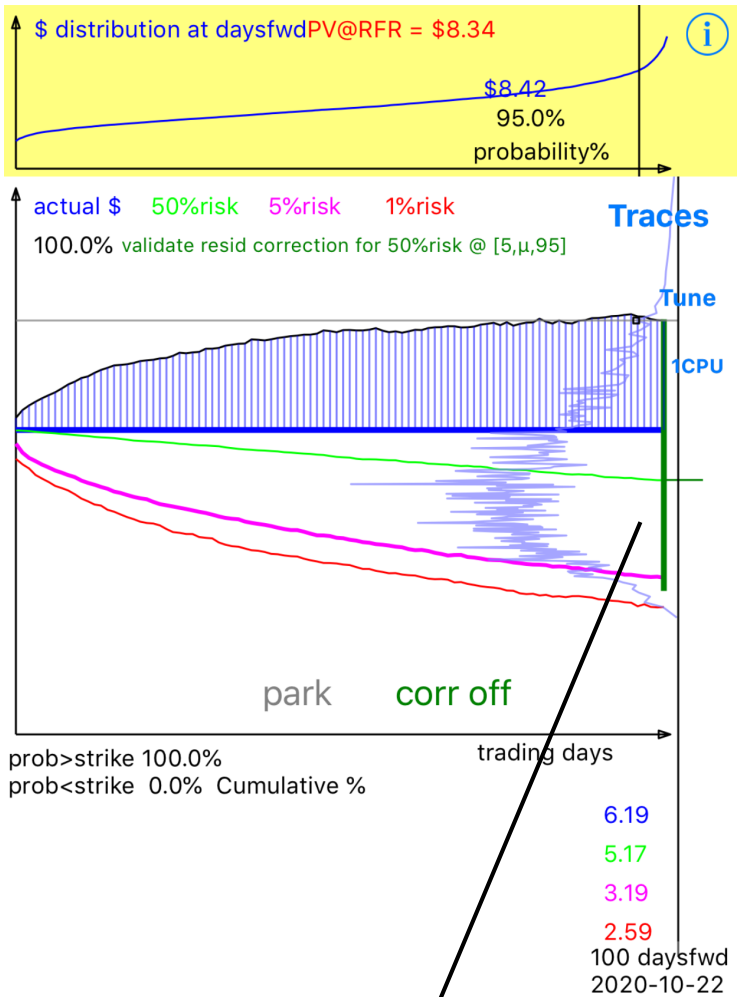
days withheld, set it to 0 to forecast

Run MC	5000	100	days withheld	days fwd	100
49	skip large returns > %	2.4	RFR%	days backwd to sample	252

last known price:
\$ 9.26

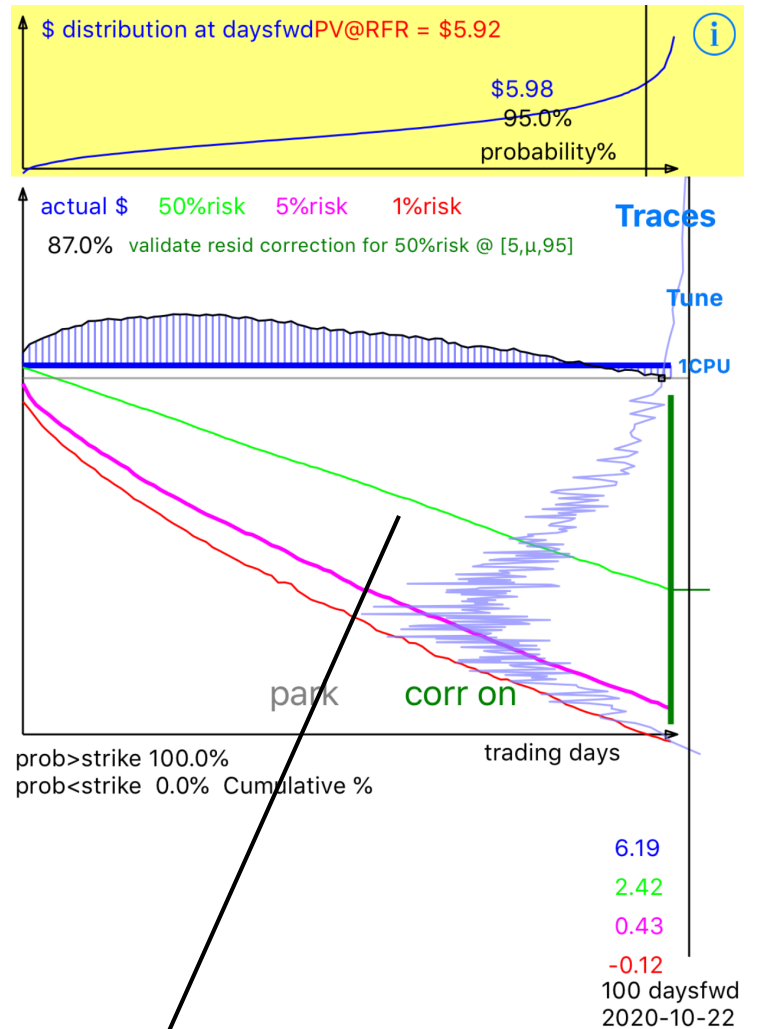
[Plot](#)

Forecast w/ drift correction off



downward price drift that arises naturally from the monte carlo results: about \$1.02 over 100 days or about 1 cent per day

Forecast w/ drift correction on



adjusted downward drift with steeper slope: about 3.8 cents / day

Notes

- We used the default setup of 100 days bulk backtest, then did the exhaustive validate for 100 additional days (also the default setting).
- It may be better to choose a validate time window larger than the investment horizon you are looking at.

Futures

- The current method uses validation residuals to correct or adjust the mean only (mean shift, becoming a drift adjustment as we apply it to the full time range of the forecast envelope).
- It may be possible to also apply a volatility correction using a similar technique.
- Stay tuned for future app updates!

Summary

- The correction factor is determined by a more extensive Validate backtest of a drift-diffusion monte carlo model.
- This Validate step (from which a correction factor is derived) can be done over a much longer time frame than our drift-diffusion time horizon.
- Hence, more long term information can be included in a short-term forecast model.
- The correction is a mean-shift of the final probability distribution of the drift diffusion model, and then this mean shift is shrunk back in time linearly.
- The effect of the correction is a drift adjustment to the original drift-diffusion model.
- Note that since the uncorrected drift-diffusion model is generated from an empirical returns monte carlo simulation rather than analytically, there is no analytic "drift" term in the uncorrected model. The drift appears naturally out of the monte carlo results and need not be linear, though in practice it is usually close to linear.

Part 2: Volatility correction

- Available on iPhone and iPad versions of the app.
 - (soon to be available on MacOS versions)
- The predictor-corrector method has been extended to include volatility correction in the second iteration of a Validate process.
- First iteration of Validate, the mean-shift / drift correction is applied, and then the validate residuals are re-computed.
- From the new validate residuals, a volatility correction is computed and applied to the model in the second iteration.
- Validate graph and report are updated accordingly, and user may apply these corrections in the envelope graph in the Monte Carlo tab via the **corr on / corr off** button on the bottom of the graph, during a bulk backtest or during a forecast.

Example to study

- Example with symbol GE.
- We use 20 day investment horizon forecast in trading days, validated for 200 trading days.
- Here we set monte carlo iterations to 50000 (10x default) for better repeatability of results.

20 day bulk backtest GE

This backtest validated 200 days

Note report: **reality was more risky than model**

PDF Run MC 50000 20 days withld opn intr hide bubbles hide grid get call/put grid (mkt) days fwd 20

skip large returns > % 49 RFR% 2.4 bubble size days backwd to sample 252

multi CPU Traces Tune adjust view reset 3D tilt 3D highlight 1 MC trace 3D view probability surf mesh contour color grey power func fit @ const prob

\$ distribution at daysfwd PV@RFR = 8.60

8.61 95.0% probability

actual \$ 50%risk 5%risk 1%risk validate resid correction for 50%risk @ [5,μ,95]

100.0% price(daysfwd) = a + b*((daysfwd-1)^c) [switch on bottom right of screen]

6.86 6.46 4.84 4.28 20 daysfwd 2020-07-24

park find corr off trading days

prob>strike 100.0% model
prob<strike 0.0% Cumulative %

backtest residual analysis:
blue(actual \$)-black(const prob at 95.0%ile)
resid mean = \$ -1.143
resid stdev = \$ 0.354
5th = \$ -1.754 (0)
95th = \$ -0.505 (19)

find min [mean]
find realized ~95th
find realized ~5th

Copy Absolute

Press red Plot button on upper right to cycle between display modes: Plot, Traces, Report.

PDF Validate Report days to withold 200

actual \$ 99%ile 95%ile 50%risk 50%rlzd 5%rlzd 5%risk 1%risk

19.34 15.02 12.85 11.43 10.39 9.60

recent days withold

validation residual analysis:
blue(actual) - bright_green(50%ile)
resid mean = \$ -0.234
resid stdev = \$ 1.907
1st = \$ -6.272 (1)
5th = \$ -4.887 (9)
95th = \$ 2.732 (190)
99th = \$ 2.980 (198)

1x linear

Validate versus realized 50th %ile

50%... 5%rlzd

Pred corr feedback loop sum(mean of prior validate resids) \$ 0

Predictor corrector example iteration 0 volatility correction 1

Checks for the past 200 days at the following percentiles:

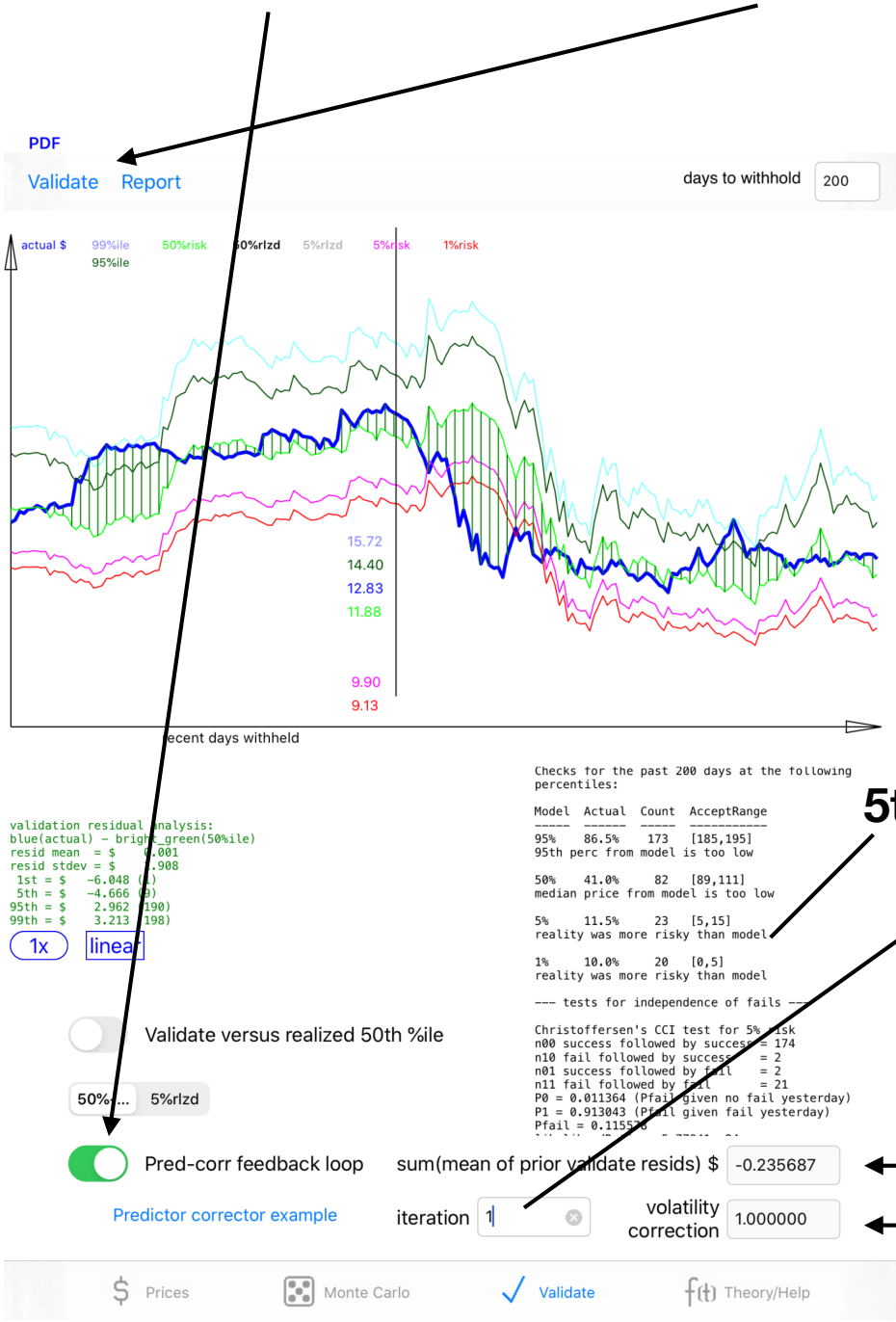
Model	Actual	Count	AcceptRange
95%	87.5%	175	[185,195]
95th perc from model is too low			
50%	51.5%	103	[88,112]
reasonable model of median			
5%	13.0%	26	[5,15]
reality was more risky than model			
1%	10.5%	21	[0,5]
reality was more risky than model			

--- tests for independence of fails ---

Christoffersen's CCI test for 5% risk
n00 success followed by success = 169
n10 fail followed by success = 4
n01 success followed by fail = 4
n11 fail followed by fail = 22
P0 = 0.023121 (Pfail given no fail yesterday)
P1 = 0.846154 (Pfail given fail yesterday)
Pfail = 0.130653

5% target coming in at 13%, 1% target coming in at 10.5%

Switch on pred-corr button, then re-Validate



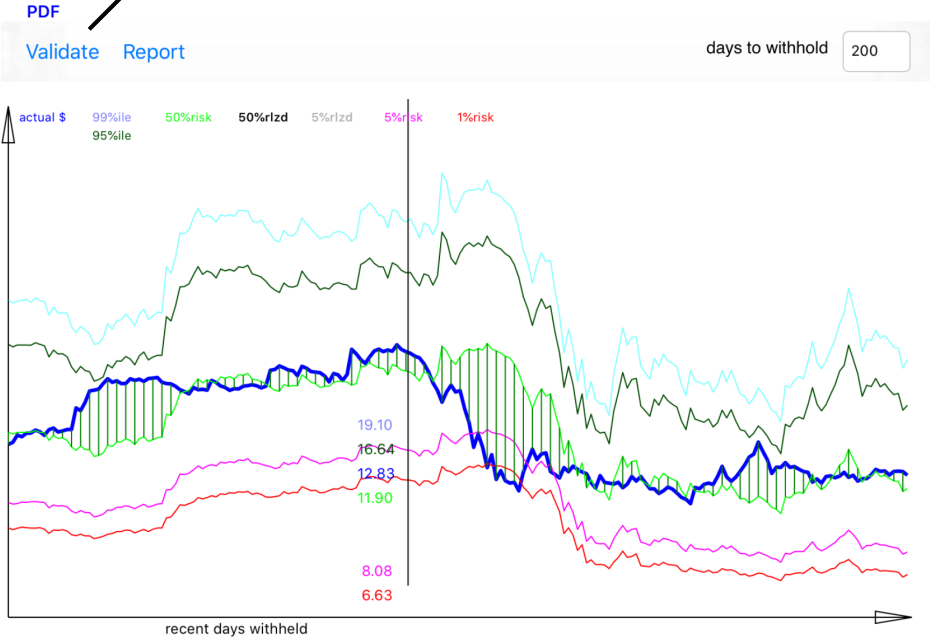
Pred-corr Iteration 1, drift correction has been applied but it is only -24 cents.

5th and 1st percentile targets only a little better

**5th --> was 13%, now 11.5%
1st --> was 10.5%, now 10%**

**The drift correction (mean shift)
No volatility correction yet when this shows as 1.0**

To get volatility correction, press **Validate** again



targets are better now
 5% --> 6.5% actual
 1% --> 3.5% actual

validation residual analysis:
 blue(actual) - bright_green(50%ile)
 resid mean = \$ -0.000
 resid stdev = \$ 1.908
 1st = \$ -6.058 (1)
 5th = \$ -4.659 (9)
 95th = \$ 2.954 (190)
 99th = \$ 3.214 (198)

Checks for the past 200 days at the following percentiles:

Model	Actual	Count	AcceptRange
95%	100.0%	200	[185,195]
95th perc from model is too high			
50%	40.5%	81	[88,111]
median price from model is too low			
5%	6.5%	13	[5,15]
reasonable model of 5% risk level			
1%	3.5%	7	[0,5]
reality was more risky than model			

--- tests for independence of fails ---

Christoffersen's CCI test for 5% risk
 n00 success followed by success = 184
 n10 fail followed by success = 2
 n01 success followed by fail = 2
 n11 fail followed by fail = 11
 P0 = 0.010753 (Pfail given no fail yesterday)
 P1 = 0.846154 (Pfail given fail yesterday)
 Pfail = 0.065327

5% is within suggested tolerance
 1% still a bit off

the correction amount (multiplication factor)

Validate versus realized 50th %ile

50%... 5%rlzd

Pred-corr feedback loop

sum(mean of prior validate resids) \$ -0.234585

Predictor corrector example iteration

volatility correction

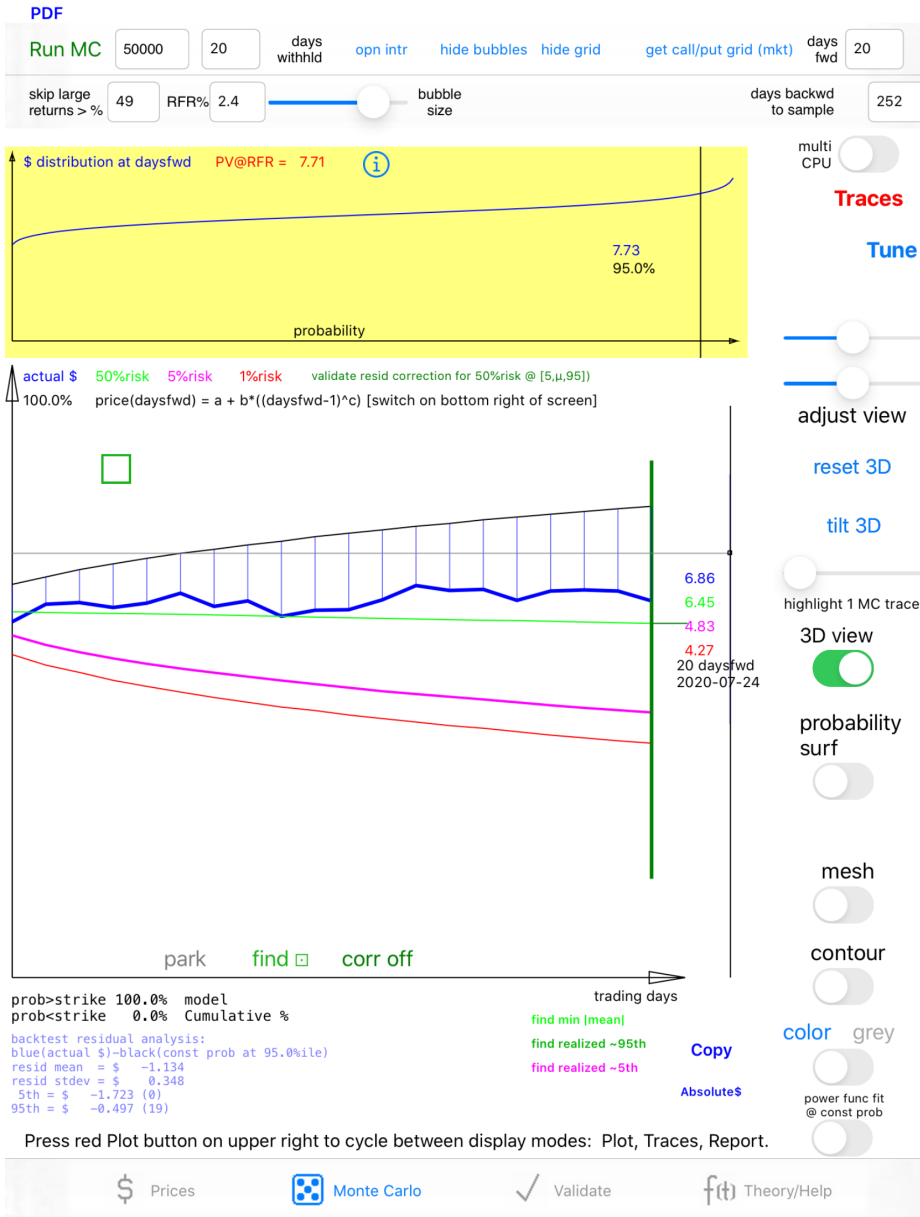
Prices
 Monte Carlo
 Validate
 Theory/Help

Now iteration 2, volatility correction has been applied

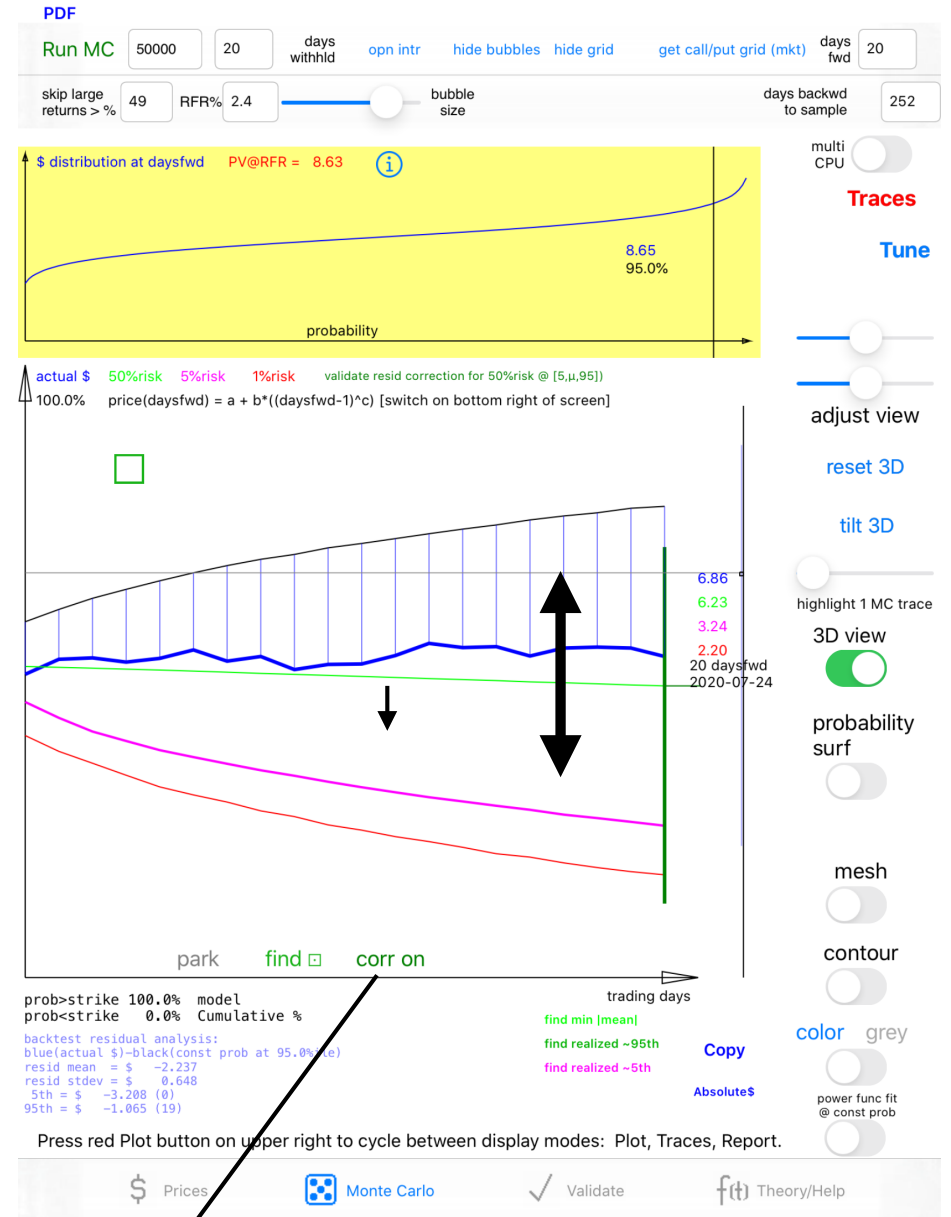
Discussion

- Volatility correction amount = 1.9x --> huge because our model had underestimated risk when backtested with our exhaustive validate backtest procedure.
- Backtest period involved COVID19 virus era, high unanticipated volatility.
- Volatility correction and mean shift (drift correction) are applied to the model surface after it is generated.

mean + volat correction off



mean + volat correction on slight downward drift included, large ~1.9x increase in diffusion (volatility over time)



tap to toggle corrections on/off after they are computed in Validate screen

Alternate use of volatility correction factor

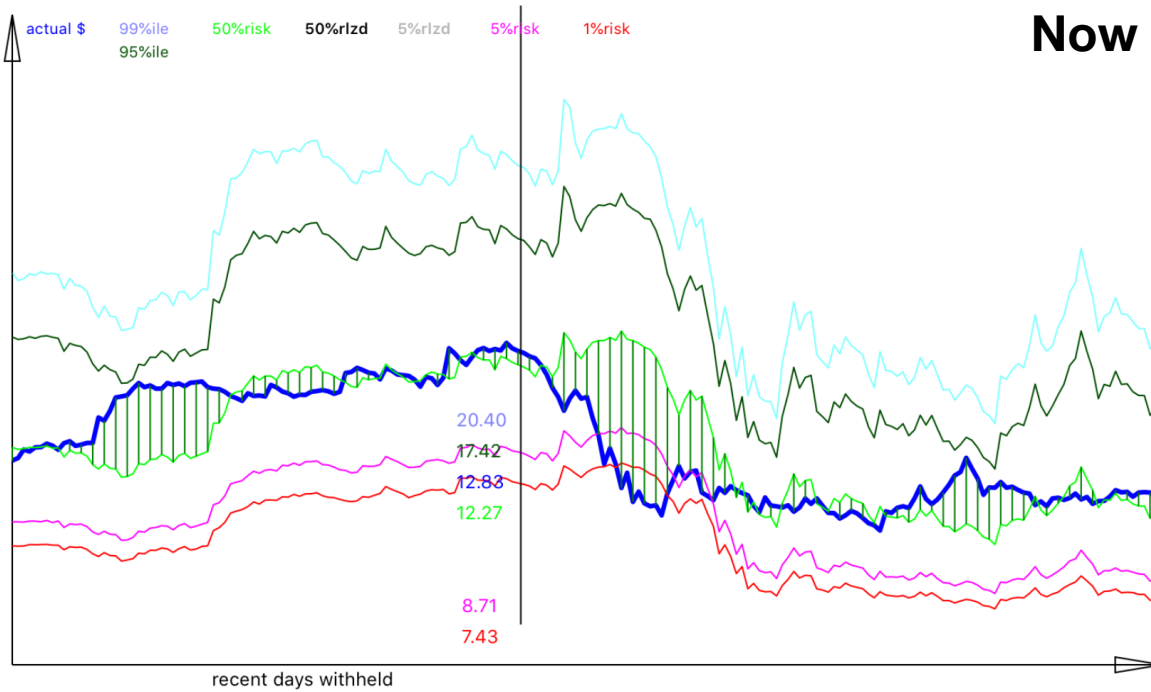
- Use the suggested volatility correction factor 1.904, apply that to the volatility model tuning parameter at model generation time.

The screenshot shows a software interface for Monte Carlo simulation. At the top, there are controls for 'Run MC' (50000), 'days withhld' (20), and 'days fwd' (20). Below this, there are sliders for 'skip large returns > %' (49), 'RFR%' (2.4), and 'bubble size'. The main area displays various statistics: 'last known price: \$ 6.68', 'n prices = 4340', 'daily return Price(today)/Price(yesterday) sample [max,min] = [1.147, ...]', 'estimated price at 20 days', and 'estimated loss risks at 20'. A central panel is open, showing 'Strike price \$' (empty), 'Volat scale' (1.904), and 'Skew adjust' (0.0). It also includes 'Cumulative %', 'At Days Fwd', 'Hurst pre-roll', 'Fractional Brownian-type motion with empirical rtns distrib', 'BlackSwan config', and 'Serial sampling max runlen'. The bottom of the interface has a navigation bar with icons for '\$ Prices', 'Monte Carlo', 'Validate', and 'Theory/Help'.

When in Monte Carlo tab, press Tune button to open up additional model params

Enter volatility scale

Press Close to exit



Now with manually adjusted volatility of input returns, we get targets

5% --> 9.0%
1% --> 4.0%

Hence, the volatility correction factor can be used as a seed point for manual model calibration also.

validation residual analysis:
 blue(actual) - bright_green(50%ile)
 resid mean = \$ -0.141
 resid stdev = \$ 1.998
 1st = \$ -6.414 (1)
 5th = \$ -5.044 (9)
 95th = \$ 3.026 (190)
 99th = \$ 3.322 (198)

Checks for the past 200 days at the following percentiles:

Model	Actual	Count	AcceptRange
95%	100.0%	200	[185,195] 95th perc from model is too high
50%	48.5%	97	[88,112] reasonable model of median
5%	9.0%	18	[5,15] reality was more risky than model
1%	4.0%	8	[0,5] reality was more risky than model

shut off this and clear iteration with X before revalidating

--- tests for independence of fails ---

Christoffersen's CCI test for 5% risk
 n00 success followed by success = 178
 n10 fail followed by success = 3
 n01 success followed by fail = 3
 n11 fail followed by fail = 15
 P0 = 0.016575 (Pfail given no fail yesterday)
 P1 = 0.833333 (Pfail given fail yesterday)
 Pfail = 0.090452

1x linear

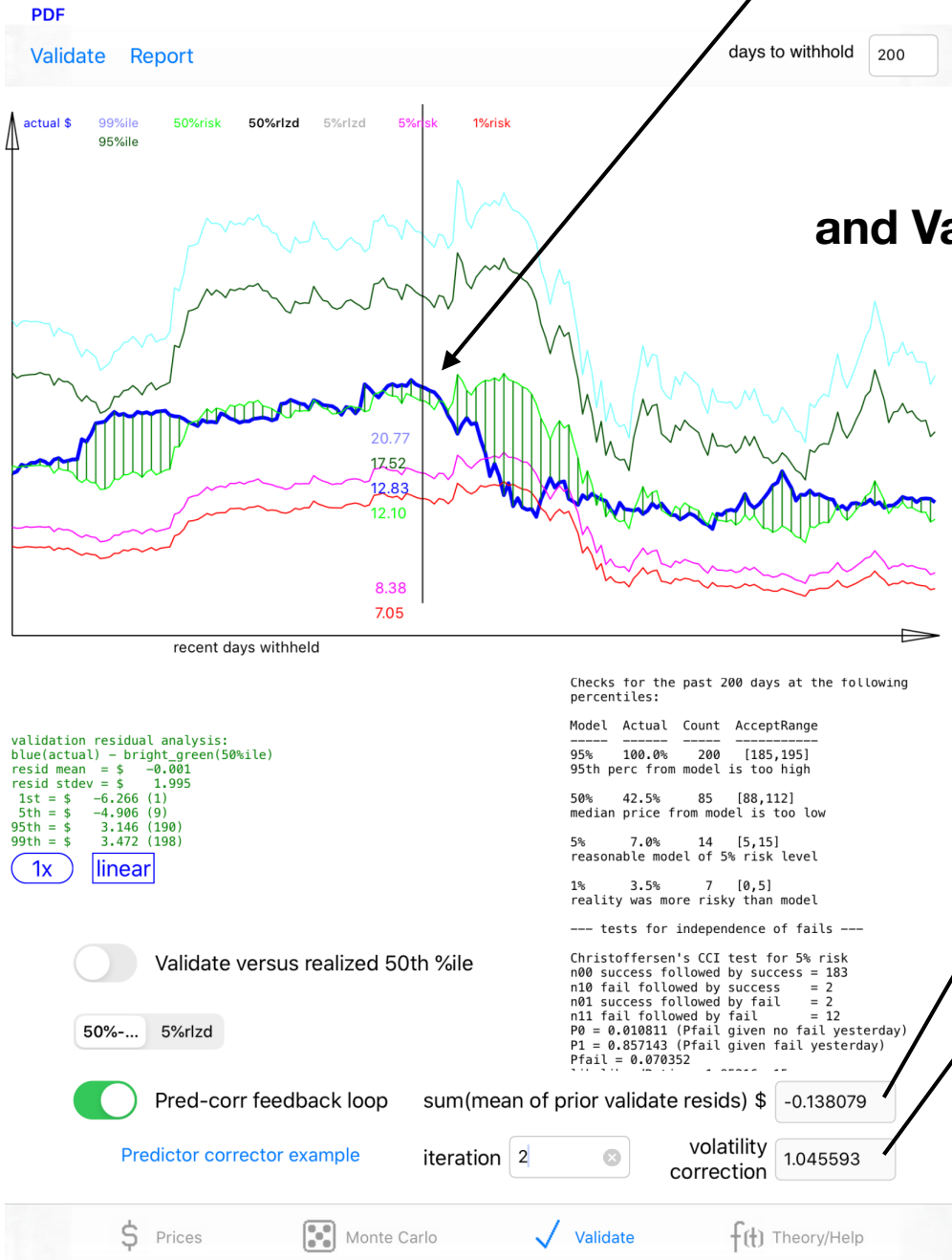
Validate versus realized 50th %ile

50%-... 5%rlzd

Pred-corr feedback loop sum(mean of prior validate resids) \$ 0

Predictor corrector example iteration 0 volatility correction 1

Beginning of COVID19 crisis of 2020



Now we re-apply pred-corr and Validate twice (first time gives us mean shift, 2nd time volatility correction)

Both mean shift and volatility factor will be different now

Volatility correction factor will be close to 1 since we have put the suggested factor on the input daily returns data set already.

We can apply this 1.046 here again to the prior correction factor to iterate.

prior vol correct + new vol correct = $1.904 * 1.046 = 1.99$

Set volat scale to 1.99 now

Strike price \$
for call / put / etc

Volat scale 1.99 **Vs++**

Typical values in the range -0.2 (bearish) to 0.2 (bullish) **Vs--**

Skew adjust 0.0 **Close**

Cumulative % **At Days Fwd** Hurst pre-roll

up to and including "European" at daysfwd

Fractional Brownian-type motion with empirical rtns distrib

Hurst [0 to 1] 0.5 > 0.5 smoother, trend following
0.5 for i.i.d < 0.5 oscillating, mean reverting

BlackSwan config 7 % daily drop Prob of occurrence 0.1 %
± 1 %

BlackSwan events Serial sampling max runlen 1

Symmetric bull/bear

Use fractional differencing Fractional difference level 1.0

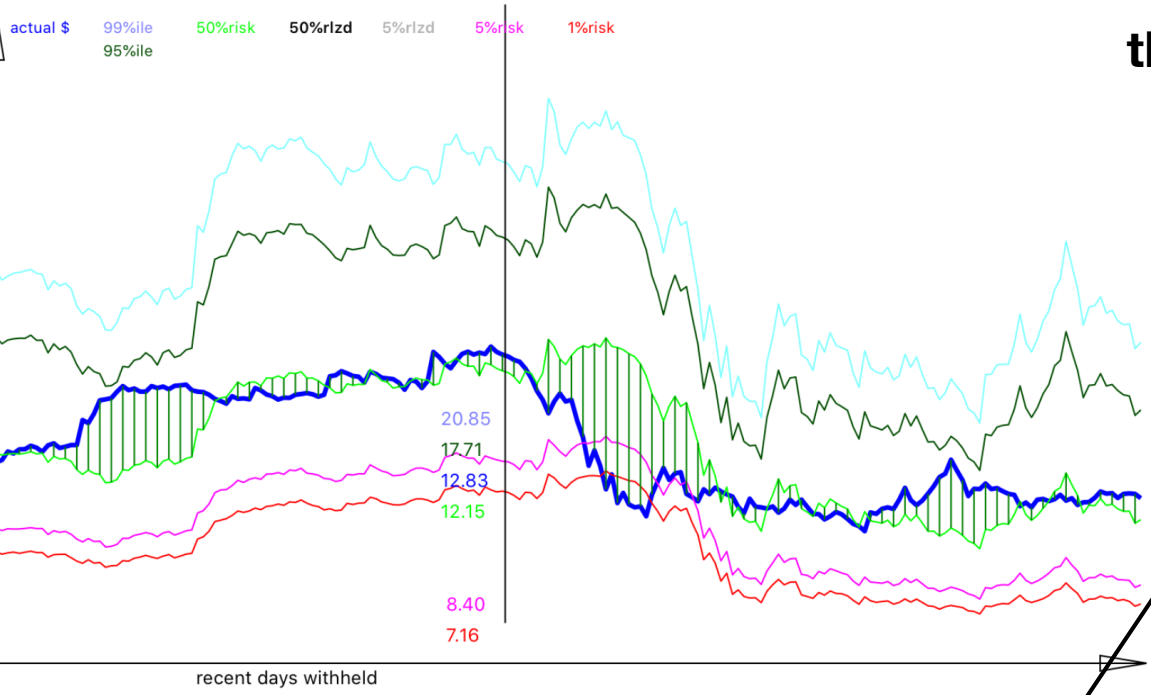
Fractional differencing ON overrides Hurst settings.

Monte Carlo model tuning and simple 'options' / strike price features. Scroll for more info.

Adjust historic volatility and skew, or add random black swan events with your choice of magnitude and probability to calibrate models to backtests.

"Serial sampling max runlen": set to 1 to

days to withhold



Now clear and re-do the validate, then redo the pred-corr steps as before

metrics are suggesting model is estimating a bit low on average, yet is underestimating 1% risk

5th percentile ok

1st percentile (fat tail issue) needs work as before

Voila! now it suggests volatility correction of ~1.00means we got it right!

validation residual analysis:
 blue(actual) - bright_green(50%ile)
 resid mean = \$ -0.000
 resid stdev = \$ 2.006
 1st = \$ -6.295 (1)
 5th = \$ -4.920 (9)
 95th = \$ 3.178 (190)
 99th = \$ 3.495 (198)

1x linear

Checks for the past 200 days at the following percentiles:

Model	Actual	Count	AcceptRange
95%	100.0%	200	[185,195]
95th perc from model is too high			
50%	41.5%	83	[88,112]
median price from model is too low			
5%	7.0%	14	[5,15]
reasonable model of 5% risk level			
1%	3.5%	7	[0,5]
reality was more risky than model			

--- tests for independence of fails ---

Christoffersen's CCI test for 5% risk
 n00 success followed by success = 183
 n10 fail followed by success = 2
 n01 success followed by fail = 2
 n11 fail followed by fail = 12
 P0 = 0.010811 (Pfail given no fail yesterday)
 P1 = 0.857143 (Pfail given fail yesterday)
 Pfail = 0.070352

Validate versus realized 50th %ile

50%-... 5%rlzd

Pred-corr feedback loop sum(mean of prior validate resids) \$ -0.124606

Predictor corrector example iteration

volatility correction

Discussion

This example illustrates the difficulty of fitting both central tendency and extreme bearish risk at the same time. Central tendency is already forecasting a bit low, but model is underestimating 1% risk. If we push the whole distribution down more, we may be able to estimate 1% risk better, but we will make the central tendency forecast worse.

So we can't just use a brute force mean shift all the time.

We probably want to do something about increasing the fatness of the tails of our input returns distribution, such as perhaps adding some Black Swan events.

In our current software, we don't have a parameter to adjust the kurtosis (fatness of the tails) directly, but stay tuned for more updates!

With volatility correction pre-applied in the model tuning factor, we see little difference when applying the "corr(ection) on" switch to our bulk backtest, since the wider volatility is already accounted for in the generated model, and our mean shift correction was only -12 cents.

PDF Run MC 50000 20 days withhld opn intr hide bubbles hide grid get call/put grid (mkt) days fwd 20

skip large returns > % 49 RFR% 2.4 bubble size days backwd to sample 252

multi CPU

Traces

Tune

adjust view

reset 3D

tilt 3D

highlight 1 MC trace

3D view

probability surf

mesh

contour

color grey

power func fit @ const prob

Press red Plot button on upper right to cycle between display modes: Plot, Traces, Report.

\$ Prices Monte Carlo Validate Theory/Help

\$ distribution at daysfwd PV@RFR = 10.67

10.69 95.0%

probability

actual \$ 50%risk 5%risk 1%risk validate resid correction for 50%risk @ [5,μ,95]

100.0% price(daysfwd) = a + b*((daysfwd-1)^c) [switch on bottom right of screen]

6.86 6.10 3.38 2.61 20 daysfwd 2020-07-24

park find corr off

trading days

prob>strike 100.0% model
prob<strike 0.0% Cumulative %

backtest residual analysis:
blue(actual \$)-black(const prob at 95.0%ile)
resid mean = \$ -2.558
resid stdev = \$ 0.816
5th = \$ -3.827 (0)
95th = \$ -1.129 (19)

find min |mean|
find realized ~95th
find realized ~5th

Copy Absolute\$

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\$ Prices Monte Carlo Validate Theory/Help

\$ distribution at daysfwd PV@RFR = 8.77

8.78 95.0%

probability

actual \$ 50%risk 5%risk 1%risk validate resid correction for 50%risk @ [5,μ,95]

100.0% price(daysfwd) = a + b*((daysfwd-1)^c) [switch on bottom right of screen]

6.86 5.97 3.31 2.53 20 daysfwd 2020-07-24

park find corr on

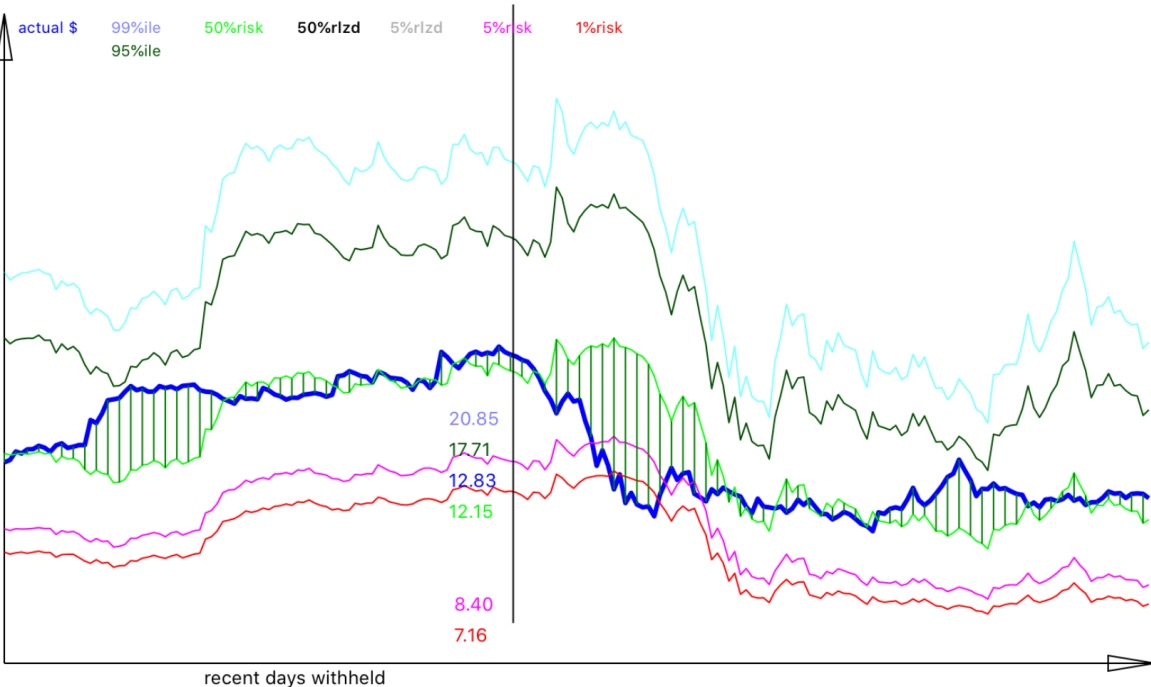
trading days

prob>strike 100.0% model
prob<strike 0.0% Cumulative %

backtest residual analysis:
blue(actual \$)-black(const prob at 95.0%ile)
resid mean = \$ -2.439
resid stdev = \$ 0.745
5th = \$ -3.548 (0)
95th = \$ -1.104 (19)

find min |mean|
find realized ~95th
find realized ~5th

Copy Absolute\$



**mean shift correction small,
so not a large difference
when applying correction
to envelope forecast**

validation residual analysis:
blue(actual) - bright_green(50%ile)
resid mean = \$ -0.000
resid stdev = \$ 2.006
1st = \$ -6.295 (1)
5th = \$ -4.920 (9)
95th = \$ 3.178 (190)
99th = \$ 3.495 (198)

1x linear

Checks for the past 200 days at the following percentiles:

Model	Actual	Count	AcceptRange
95%	100.0%	200	[185,195]
95th perc from model is too high			
50%	41.5%	83	[88,112]
median price from model is too low			
5%	7.0%	14	[5,15]
reasonable model of 5% risk level			
1%	3.5%	7	[0,5]
reality was more risky than model			

--- tests for independence of fails ---

Christoffersen's CCI test for 5% risk
n00 success followed by success = 183
n10 fail followed by success = 2
n01 success followed by fail = 2
n11 fail followed by fail = 12
P0 = 0.010811 (Pfail given no fail yesterday)
P1 = 0.857143 (Pfail given fail yesterday)
Pfail = 0.070352

Validate versus realized 50th %ile

50%-... 5%rlzd

Pred-corr feedback loop sum(mean of prior validate resid) \$ -0.124606

Predictor corrector example iteration 2 volatility correction 1.005928

**this is just an anomaly
of this particular example**

**often, there will
be a notable mean shift,
even if we pre-apply
volatility adjustments
during model generation**

Discussion

- Taking the suggested volatility correction factor and applying it to the known daily returns (Tune popup), perhaps iteratively as demonstrated here, seems to be a safer adjustment if the forecast range is long.
- Why? Because if we pre-apply the correction factor, the generated forecast surface will remain with price > 0 .
- If we have a large volatility correction like this (e.g. 1.9x in this example) and the price of the asset is low, and its volatility is high, the "correction" could push the model forecast surface into the negative price range, which is "non-physical," as the physicists like to say.
- The case of forecast dipping below zero is less likely if the forecast range is short (e.g. a few days); the quick volatility correction as applied here may be useful directly in this case.

Suggestion

← many items in this panel

Strike price \$ for call / put / etc Volat scale Vs++
Vs--
Typical values in the range -0.2 (bearish) to 0.2 (bullish)
Skew adjust **Close**

Cumulative % At Days Fwd Hurst pre-roll
up to and including daysfwd "European" at daysfwd

Fractional Brownian-type motion with empirical rtns distrib
Hurst [0 to 1] > 0.5 smoother, trend following
0.5 for i.i.d < 0.5 oscillating, mean reverting

BlackSwan config % daily drop Prob of occurrence per day %
± %

BlackSwan events Serial sampling max runlen

Symmetric bull/bear

Use fractional differencing Fractional difference level

Fractional differencing ON overrides Hurst settings.

Monte Carlo model tuning and simple 'options' / strike price features. Scroll for more info.

Adjust historic volatility and skew, or add random black swan events with your choice of magnitude and probability to calibrate models to backtests.

"Serial sampling max runlen": set to 1 to

PDF

Run MC days withhd opn intr hide bubbles hide grid get call/put grid (mkt) days fwd

skip large returns > % RFR% bubble size days backwd to sample

Uniform Linear Decay Back Power Decay Back

If you change any parameter that causes a difference in model generation, you should clear the pred-corr setup and re-Validate the model to get updated correction factors for mean and/or volatility.