Error SDE (V_t) moments

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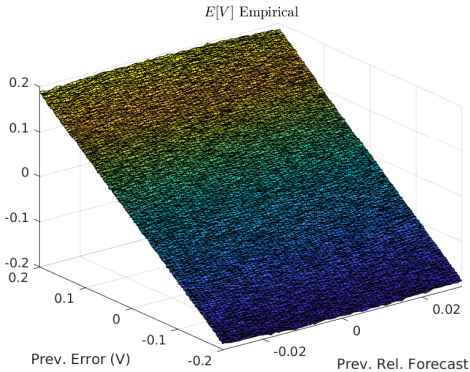
Introduction:

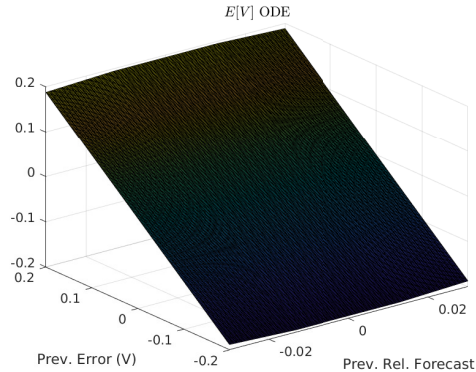
In the next four slides, we will show approximations for the first and the second moment of the Error process SDE (the error V_t). We do the next for each moment:

We solve the moments ODE for only one Δt, corresponding to the minimum time between two real measurements (10 minutes or $1/(24*60)$ with no dimensions). We have three main times, t_0, $t_1 = t_0 + \Delta t$, and $t_2 = t_0 + 2\Delta t$. We sweep over p_{t_0}, but we fix $p_{t_1} = p_{t_2} = 1/2$. $p_{t_0} \in [p_{t_1} - 0.03, p_{t_1} + 0.03]$, because the maximum Δp measured during the year follows $|\Delta p| < 0.03$. In the case of the initial error V_{t_0}, we have that $V_{t_0} \in [-0.2, 0.2]$, for the same reason.

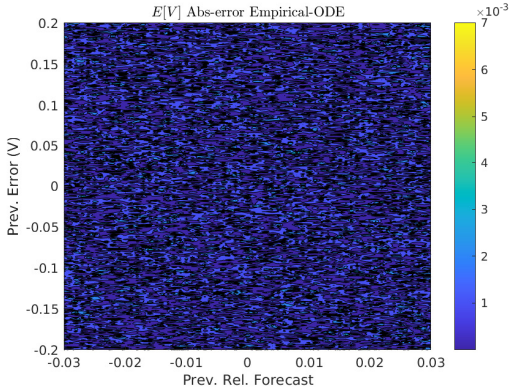
To find the empirical moments, we simulate thousands of times the corresponding SDEs for only one time transition Δt, and average the solution at time t_1.

Approximated first moment for V_t:

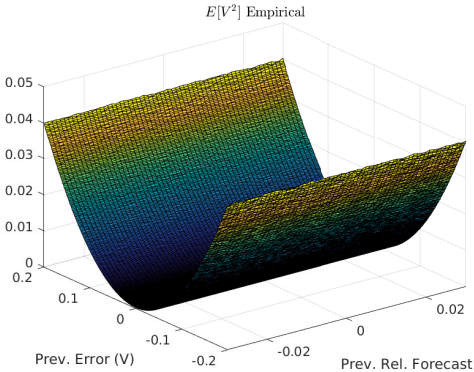


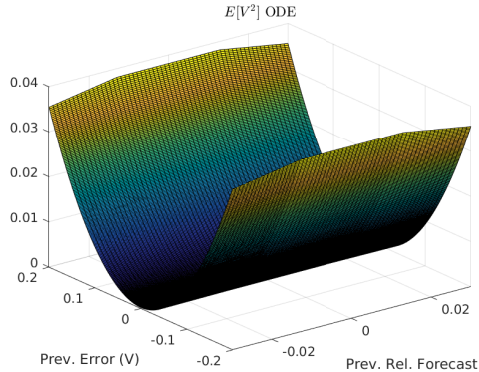


Approximated first moment for V_t:

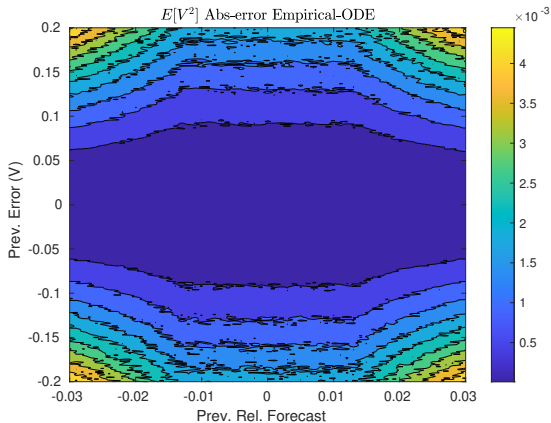


Approximated second moment for V_t:





Approximated second moment for V_t:



Error in the moments (1/2):

In the next plot, we sweep over the value of p_{t_1} from 0.2 to 0.8 (we still fix $p_{t_1} = p_{t_2}$).

For each value of p_{t_1}, we repeat the procedure of slide (2). After we have the error matrices (see slides 4 and 6), we just compute the average for each matrix. The result can be seen in the next slide.

Error in the moments (2/2):