

Bin Monte Carlo

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KaonLT Experiment, Jefferson Lab Hall C



University
of Regina

Goal: determine how many bins are needed to properly measure asymmetry

☞ Create function with known inputs A , B and C

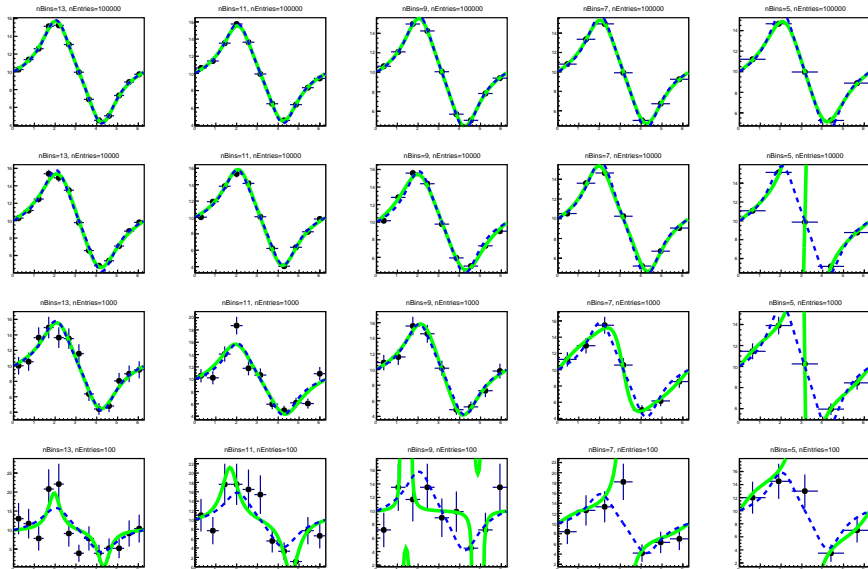
$$f(x) \propto y \propto \frac{A \sin x}{1 + B \cos x + C \cos 2x}$$

☞ Fill histogram with **nBins** according to $f(x)$ for **nEntries**

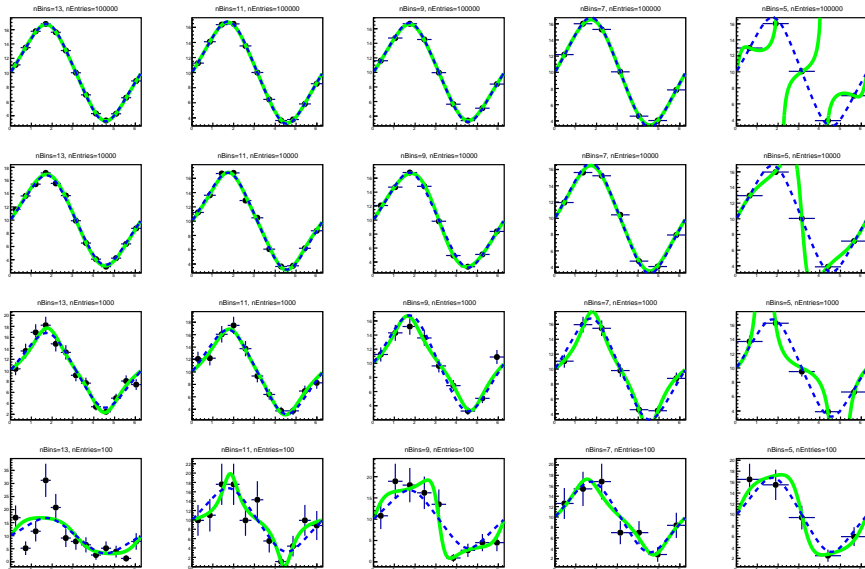
☞ Fit with function $g(x)$ with free parameters A , B and C

$$g(x) \propto y \propto \frac{A \sin x}{1 + B \cos x + C \cos 2x}$$

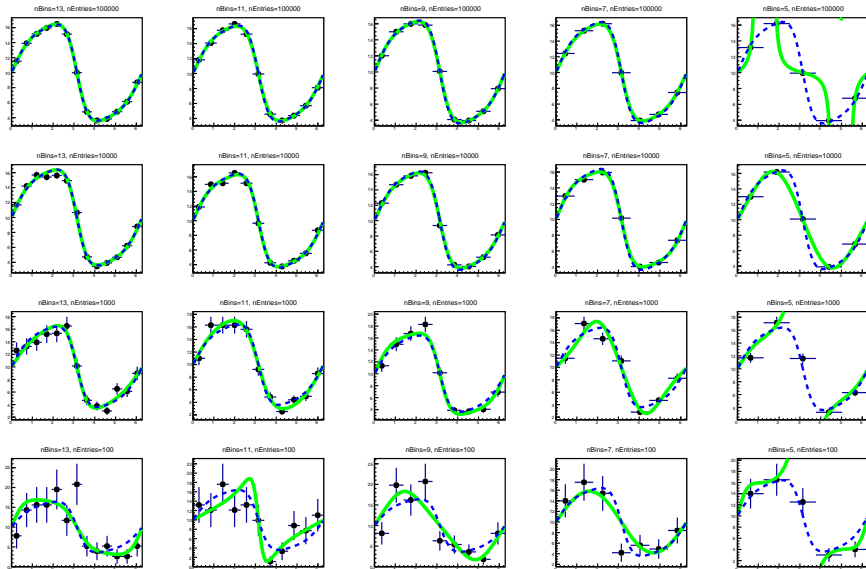
A = 3; B = 0.8; C=0.3



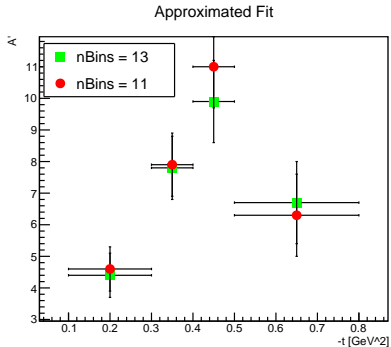
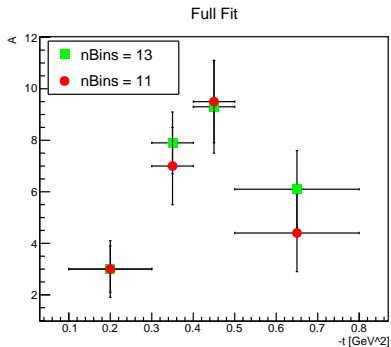
A = 6; B = 0.2; B=0.1



A = 7; B = 0.3; -0.2



Comparing results from different binning for real data:



Proposed Bins

Q^2	W	Bins in -t	Bins in \hat{A}
5.5	3.02	4	13
4.4	2.74	5	13
3	2.32	7	15
3	3.14	7	15
2.1	2.95	8	15

S. Diehl et al new paper: <https://arxiv.org/pdf/2210.14557.pdf>

$$BSA(Q^2, W, t, \Delta) \propto \frac{P \overline{(1 + 2)^{\frac{3}{4} \frac{\Delta}{\Lambda_0}}} \sin \Delta}{1 \Delta^2 \overline{(1 + 2)^{\frac{3}{4} \frac{\Delta}{\Lambda_0}}} \cos \Delta \Delta^2 \overline{(1 + 2)^{\frac{3}{4} \frac{\Delta}{\Lambda_0}}} \cos 2\Delta}$$

- ç Could we reasonably extract $\frac{3}{4} \frac{\Delta}{\Lambda_0}$ and $\frac{3}{4} \frac{\Delta}{\Lambda_0}$ as well?
- ç Using Diehl's data and ours, we could do two Q^2 scans at fixed x_B

Let's See Some Numbers

- ç Repeat bin MC for inputs $n\text{Entries}$, $n\text{Bins}$, A , B , C
- ç Record output values of A , B , C
- ç Compare with input

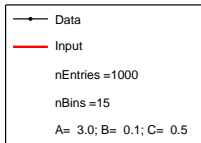
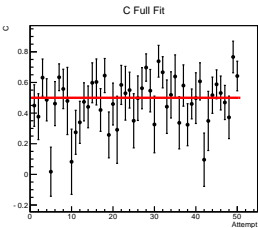
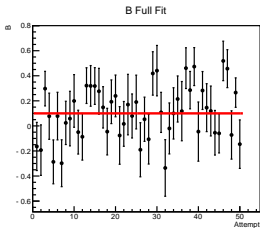
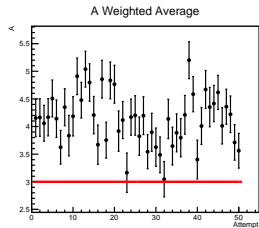
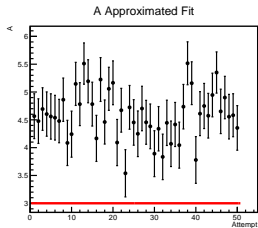
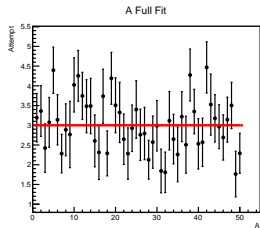
Disclaimer: I had covid when I did this

A=3; B=C=0

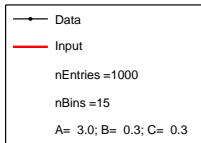
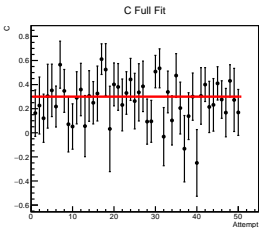
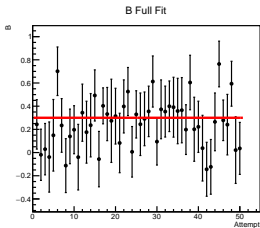
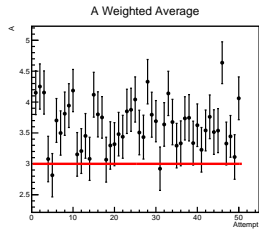
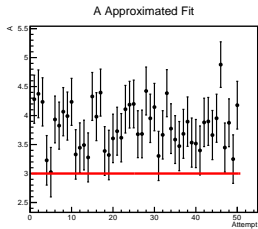
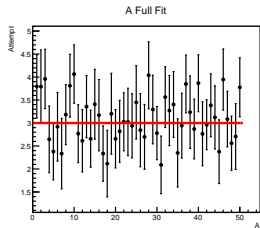
$A=3; B=C=0.1$

A=3; B=0.5; C=0.1

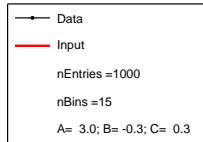
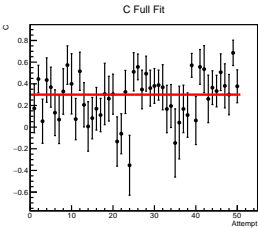
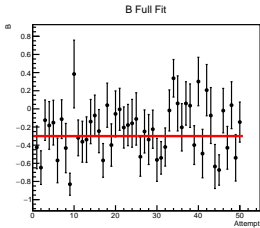
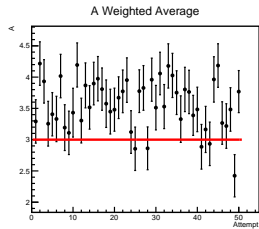
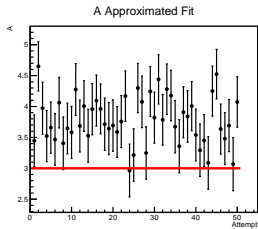
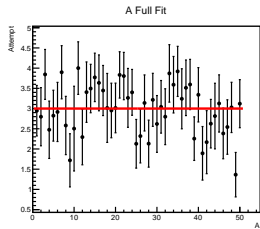
A=3; B=0.1; C=0.5



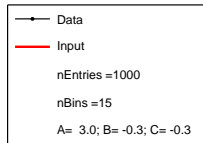
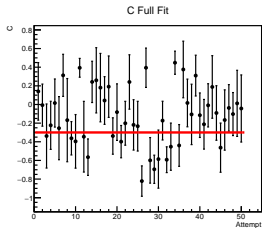
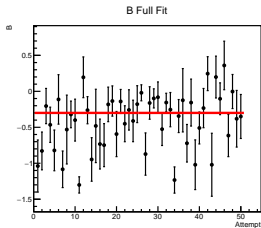
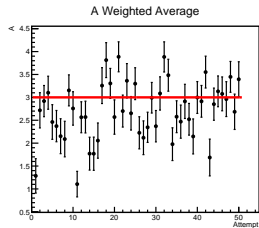
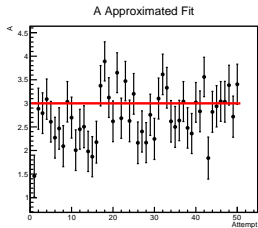
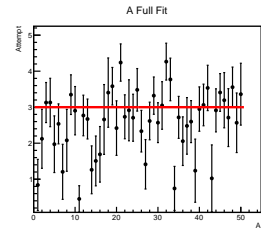
A=3; B=C=0.3



A=3; B=-0.3; C=0.3



A=3; B=-0.3; C=-0.3



A=3; B=0.3; C=-0.3

