wCombinations_6s0s

February 6, 2019

In [19]:
```
import math
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
plt.style.use('./matplotlibrc')
```

In [44]:
```
df = pd.read_csv('../../FESR/configurations/wCombinations/6_s0s/fits.csv', header=1)
df.index = [
    r'$\omega_{cube}, \omega_{quad}$',
    r'$\omega_{kin}, \omega_{cube}$',
    r'$\omega_{kin}, \omega_{cube}, \omega_{quart}$',
    r'$\omega_{kin}, \omega_{quart}$'
]
```

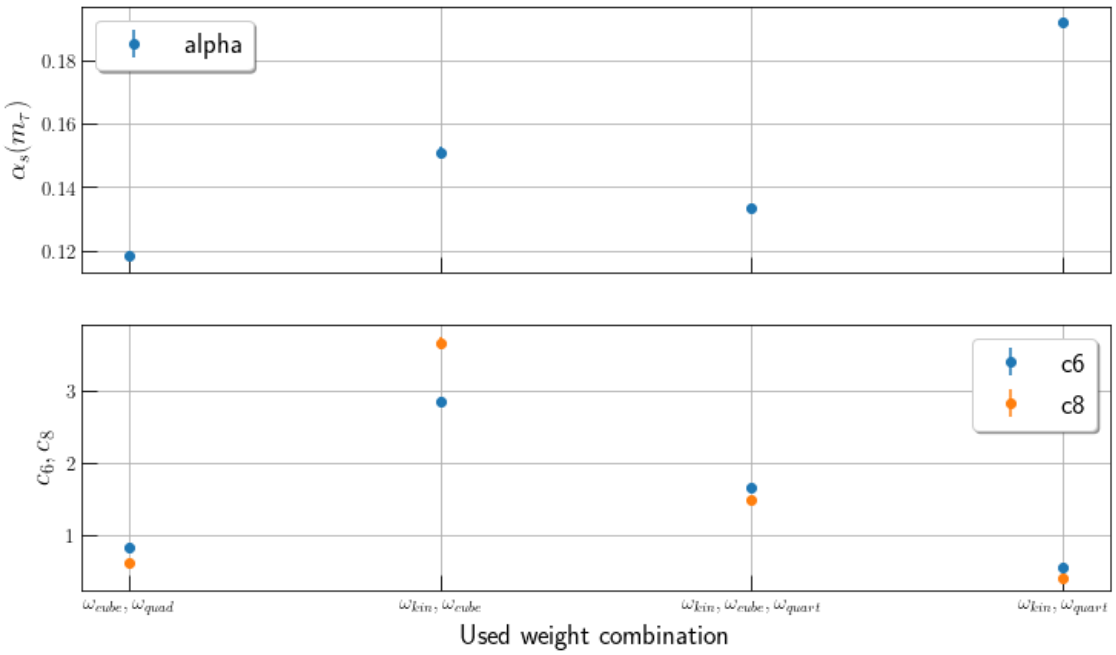
In [115]:
```
df[['alpha', 'c6', 'c8']]
```

Out[115]:

	alpha	c6	c8
$\omega_{cube}, \omega_{quad}$	0.118376	0.832705	0.622246
$\omega_{kin}, \omega_{cube}$	0.150673	2.841079	3.652895
$\omega_{kin}, \omega_{cube}, \omega_{quart}$	0.133401	1.664969	1.488956
$\omega_{kin}, \omega_{quart}$	0.191789	0.542208	0.409060

In [132]:
```
figure, axes = plt.subplots(2, 1, sharex=True)
axes[0].errorbar(df.index, df['alpha'], df['alphaErr'], marker='o', linestyle='none')
axes[0].set_ylabel(r'$\alpha_s(m_\tau)$')
axes[0].legend()

axes[1].errorbar(df.index, df['c6'], df['c6Err'], marker='o', linestyle='none')
axes[1].errorbar(df.index, df['c8'], df['c8Err'], marker='o', linestyle='none')
axes[1].set_ylabel(r'$c_6, c_8$')
axes[1].set_xlabel('Used weight combination')
axes[1].legend()
figure.set_size_inches(12, 7)
```

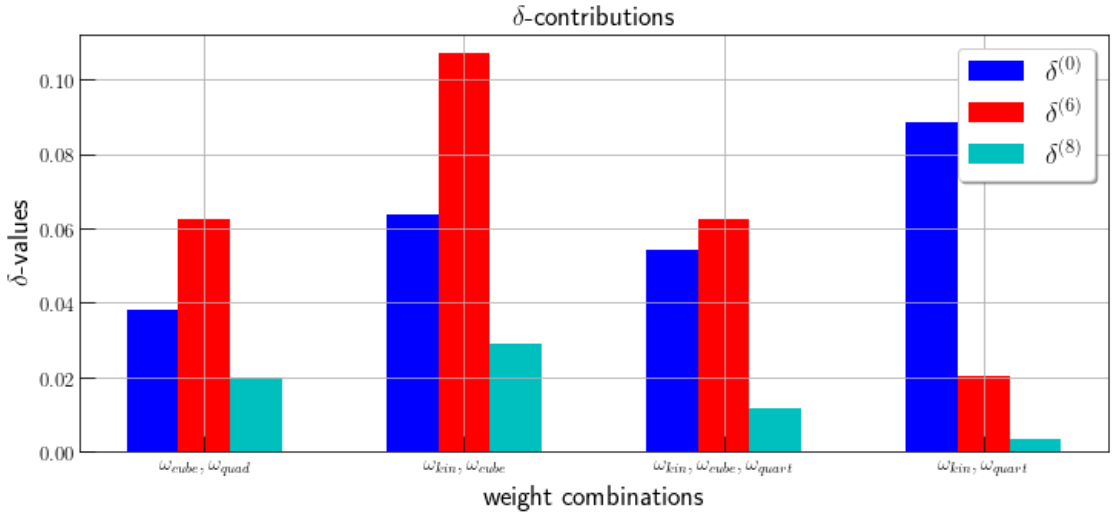


We plotted the values for the all possible combinations of the weights $\omega_{kin}, \omega_{cube}$ and ω_{quart} for six $s_0 s$ moment for each combination. Consequently the three combinations including only two weights integrate over moments with $s0s = [m_\tau, 3.0, 2.8]$ and the one combination with all three weights use only $s_s = [m_\tau, 3.0]$. Unfortunately the value of $\max \alpha_s = 0.192$ is too low. Surprisingly the c_6 and c_8 values, which should compensate the low α_s values are also too low to be realistic. This behaviour and the almost non-existing errorbars imply that there are problems with the fitting routine (even though MINUIT has converged!). Suspicious is also the fact, that both the weights indepently deliver results of $\alpha_s > 3.0$.

```
In [155]: index = np.arange(4)
          width=0.2
          plt.gca().set_title(r'$\delta$-contributions')
          plt.bar(index, df['del^(0)'].abs(), width, color='b', label='$\delta^{(0)}$')
          plt.bar(index+width, df['del^(6)'].abs(), width, color='r', label='$\delta^{(6)}$')
          plt.bar(index+2*width, df['del^(8)'].abs(), width, color='c', label='$\delta^{(8)}$')

          plt.gca().set_xticks(index+2*width/2)
          plt.gca().set_xticklabels(df.index)
          plt.gca().set_xlabel('weight combinations')

          plt.legend()
          plt.gcf().set_size_inches(12, 5)
```



To explain the low α_s values we also plotted the absoulte values of the delta contributions of dimension $0, 6$ and 8 for each weight combination. For the first three weight combinations the OPE is not converging, because the perturbative contributions are smaller than the dimension six contributions. The fourth weight combination $(\omega_{kin}, \omega_{quart})$ seems to converge so and includes the biggest value for $\alpha_s = 0.192$, but is still $\approx 35\%$ to low if one assumes an α_s value above 0.3.