Definitions

BAC = Budget at Completion

EAC = Estimate at Completion

ETC = Estimate to Complete

TCPI = To Complete Performance Index

CPI = Cost Performance Index

SPI = Schedule Performance Index

EV = actual work completed at a specific time(i.e. work completed at the end of week 4 in the schedule in $ or units)

PA = Planned Value

AC = Actual Costs

COR = Cost of risk. Includes Administration costs, Mitigation Costs, Risk Control Costs, Transfer Costs and Lossess It can also include gains. As risk is both + and - .

RR = Realized Risk. Risk costs incurred or gains incurred in a specific time.

Equations

EAC1 = BAC / CPI, [7, p. 4]: If the project is expected to perform as it has performed prior to the data date

EAC2 = AC + (BAC - EV),[7, p. 4]: There may have been some major error in the work or performance prior to the data date; however, the project is expected to be performed within approved budget

EAC3 = AC + (BAC - EV) / CPI, [7, p. 5]: Future performance would be the same as previous performance

EAC4 = AC + (BAC - EV) / (CPI * SPI), [7, p. 5]: If the project has been affected by both the cost and schedule under performance, use this formula

EAC5 = AC + Bottom up estimate to complete: If the original estimate was wrong and cannot be relied upon to forecast accurately

ETC = EAC - AC = (Bottom up estimate to complete)

CPI = hours earned / hours expended CPI2 = EV / AC

SPI = hours earned / hours planned SPI = AC / EV

In [ ]:
```
# Import the libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
%matplotlib inline
```

In [ ]:
```
#Convert excel to csv file
df = pd.read_excel('Concrete_TakeOffs.xlsx')  # parameter (sheetname='sheet_name
') is optional
df.to_csv('Concrete_TakeOffs.csv', index=False)  # index=True to write row index
```

In [3]:
```
#Take a look at imported file
df.head()
```

Out[3]:

	Sub Tasks Concrete	Total Quantity	To-Date Quantity	Earned
0	Continous Footings	50	35	0.700000
1	Spot Footings	200	125	0.625000
2	Building Foundation Walls	350	175	0.625000
3	Building Slabs	725	346	0.477241
4	Stairs & Landings	6	0	0.000000

In [4]:
```
class Summary(object):

    # Class object attributes
    # cy = cubic yards

    # Cubic yard estimated costs installed
    est_cy = 212

    # Cubic yard actual costs installed
    act_cy = 217

    def __init__(self, quantity_installed = 1, quantity_estimated = 1):
        self.quantity_installed = quantity_installed
        self.quantity_estimated = quantity_estimated

    def SPI(self):
        return round((self.quantity_installed * Summary.est_cy) / (self.quantity_
installed * Summary.act_cy), 2)

    def CPI(self):
        return round((self.quantity_installed * Summary.act_cy) / (self.quantity_
installed * Summary.est_cy),2)

    def account_budget(self):
        return self.quantity_estimated * Summary.est_cy

    def forecast_budget(self):
        return self.quantity_estimated * Summary.act_cy
```

In [5]:
```
#Create continous footings summary dataframe
cfqi = Summary(quantity_installed = df.iloc[0,2])
cfqe = Summary(quantity_estimated = df.iloc[0,1])
percent_complete = ((cfqi.quantity_installed/cfqe.quantity_estimated) * 100)
Continous_Footings_Summary = pd.DataFrame({
    'SPI' : [cfqi.SPI()] ,
    'CPI' : [cfqi.CPI()],
    'Budget' : [cfqe.account_budget()],
    'Realized Risk' : [(cfqe.forecast_budget() - cfqe.account_budget())],
    'Forecasted Budget': [cfqe.forecast_budget()] ,
    'Percent Complete': [(percent_complete)],
})
Continous_Footings_Summary.rename(index={0:'Continous Footings Summary'}, inplac
e=True)
Continous_Footings_Summary
```

Out[5]:

	SPI	CPI	Budget	Realized Risk	Forecasted Budget	Percent Complete
Continous Footings Summary	0.98	1.02	10600	250	10850	70.0

In [6]:
```
#Continous Footing Summary Findings
#Access data (update for each Summary)
SPI = Continous_Footings_Summary.iloc[0,0]
CPI = Continous_Footings_Summary.iloc[0,1]
BAC = Continous_Footings_Summary.iloc[0,2]
Realized_Risk = Continous_Footings_Summary.iloc[0,3]
EAC = Continous_Footings_Summary.iloc[0,4]
percent_complete = Continous_Footings_Summary.iloc[0,5]
AC = (percent_complete * EAC) / 100
ETC = EAC - AC

#Calculations
EV = (BAC * percent_complete) / 100
EAC1 = round(BAC / CPI,2)
EAC2 = (AC + (BAC - EV))
EAC3 = round((AC + (BAC - EV) / CPI),2)
EAC4 = round((AC + (BAC - EV) / (CPI * SPI)),)
EAC5 = (AC + ETC)
SPI2 = round(EV / AC,2)
CPI2 = round(AC / EV,2)

#Print to check calc and inputs
print(SPI,CPI,BAC,Realized_Risk,EAC,ETC,EV,EAC1,EAC2,EAC3,EAC4,EAC5,SPI2,CPI2)

#Risk impact add in future
"""
material_delay_risk = (materials * (7 * schedule_delay_cost))
labour_delay_risk = (labour * (7 * schedule_delay_cost))
equipment_delay_risk = (equipment_delay * (7 * schedule_delay_cost))
average = ( material_delay_risk + labour_delay_risk + equipment_delay_risk)/3
impact_contingency_minimum = (communication_risk/communication_channels) * averag
e
"""
#Change from object float into a new dataframe
df1 = [{
    'SPI' : Continous_Footings_Summary.iloc[0,0],
    'CPI' : Continous_Footings_Summary.iloc[0,1],
    'BAC' : Continous_Footings_Summary.iloc[0,2],
    'Realized Risk': Continous_Footings_Summary.iloc[0,3],
    'EAC' : Continous_Footings_Summary.iloc[0,4],
    'Actual Costs' : AC,
    'ETC' : ETC,
    'EV' : EV,
    'EAC1' : EAC1,
    'EAC2' : EAC2,
    'EAC3' : EAC3,
    'EAC4' : EAC4,
    'EAC5' : EAC5,
    'SPI2' : SPI2,
    'CPI2' : CPI2}]

Continous_Footings_Summary_Output = pd.DataFrame(df1)
Continous_Footings_Summary_Output.rename(index={0:'Continous Footings Summary Out
put'}, inplace=True)
Continous_Footings_Summary_Output
```

```
0.98 1.02 10600 250 10850 3255.0 7420.0 10392.16 10775.0 10712.65 10776.0
10850.0 0.98 1.02
```

Out[6]:

	Actual Costs	BAC	CPI	CPI2	EAC	EAC1	EAC2	EAC3	EAC4	EAC5	ETC	EV	R
Continous Footings Summary Output	7595.0	10600	1.02	1.02	10850	10392.16	10775.0	10712.65	10776.0	10850.0	3255.0	7420.0	

In [7]:
```
#Create spot footings summary dataframe
sfqi = Summary(quantity_installed = df.iloc[1,2])
sfqe = Summary(quantity_estimated = df.iloc[1,1])
Spot_Footings_Summary = pd.DataFrame({
    'SPI' : [sfqi.SPI()] ,
    'CPI' : [sfqi.CPI()],
    'Budget' : [sfqe.account_budget()],
    'Realized Risk' : [(sfqe.forecast_budget() - sfqe.account_budget())],
    'Forecasted Budget': [sfqe.forecast_budget()] ,
    'Percent Complete': [((sfqi.quantity_installed/sfqe.quantity_estimated) *
100)]
})
Spot_Footings_Summary.rename(index={0:'Spot Footings Summary'}, inplace=True)
Spot_Footings_Summary
```

Out[7]:

	SPI	CPI	Budget	Realized Risk	Forecasted Budget	Percent Complete
Spot Footings Summary	0.98	1.02	42400	1000	43400	62.5

In [8]:
```
#Spot Footing Summary Findings
#Access data (update for each Summary)
SPI = Spot_Footings_Summary.iloc[0,0]
CPI = Spot_Footings_Summary.iloc[0,1]
BAC = Spot_Footings_Summary.iloc[0,2]
Realized_Risk = Continous_Footings_Summary.iloc[0,3]
EAC = Spot_Footings_Summary.iloc[0,4]
percent_complete = Spot_Footings_Summary.iloc[0,5]
AC = (percent_complete * EAC) / 100
ETC = EAC - AC

#Calculations
EV = (BAC * percent_complete) / 100
EAC1 = round(BAC / CPI,2)
EAC2 = (AC + (BAC - EV))
EAC3 = round((AC + (BAC - EV) / CPI),2)
EAC4 = round((AC + (BAC - EV) / (CPI * SPI)),)
EAC5 = (AC + ETC)
SPI2 = round(EV / AC,2)
CPI2 = round(AC / EV,2)

#Print to check calc and inputs
print(SPI,CPI,BAC,Realized_Risk,EAC,ETC,EV,EAC1,EAC2,EAC3,EAC4,EAC5,SPI2,CPI2)

#Risk impact add in future
"""
material_delay_risk = (materials * (7 * schedule_delay_cost))
labour_delay_risk = (labour * (7 * schedule_delay_cost))
equipment_delay_risk = (equipment_delay * (7 * schedule_delay_cost))
average = ( material_delay_risk + labour_delay_risk + equipment_delay_risk)/3
impact_contingency_minimum = (communication_risk/communication_channels) * averag
e
"""
#Change from object float into a new dataframe
df2 = [{
    'SPI' : Spot_Footings_Summary.iloc[0,0],
    'CPI' : Spot_Footings_Summary.iloc[0,1],
    'BAC' : Spot_Footings_Summary.iloc[0,2],
    'Realized Risk': Spot_Footings_Summary.iloc[0,3],
    'EAC' : Spot_Footings_Summary.iloc[0,4],
    'Actual Costs' : AC,
    'ETC' : ETC,
    'EV' : EV,
    'EAC1' : EAC1,
    'EAC2' : EAC2,
    'EAC3' : EAC3,
    'EAC4' : EAC4,
    'EAC5' : EAC5,
    'SPI2' : SPI2,
    'CPI2' : CPI2}]

Spot_Footings_Summary_Output = pd.DataFrame(df2)
Spot_Footings_Summary_Output.rename(index={0:'Spot Footings Summary Output'}, inp
lace=True)
Spot_Footings_Summary_Output
```

```
0.98 1.02 42400 250 43400 16275.0 26500.0 41568.63 43025.0 42713.24 43031.0
43400.0 0.98 1.02
```

Out[8]:

	Actual Costs	BAC	CPI	CPI2	EAC	EAC1	EAC2	EAC3	EAC4	EAC5	ETC	EV
Spot Footings Summary Output	27125.0	42400	1.02	1.02	43400	41568.63	43025.0	42713.24	43031.0	43400.0	16275.0	26500.0

In [9]:
```
#Create building foundation walls summary dataframe
bfqi = Summary(quantity_installed = df.iloc[2,2])
bfqe = Summary(quantity_estimated = df.iloc[2,1])
Building_Foundation_Walls_Summary = pd.DataFrame({
    'SPI' : [bfqi.SPI()] ,
    'CPI' : [bfqi.CPI()],
    'Budget' : [bfqe.account_budget()],
    'Realized Risk' : [(bfqe.forecast_budget() - bfqe.account_budget())],
    'Forecasted Budget': [bfqe.forecast_budget()] ,
    'Percent Complete': [((bfqi.quantity_installed/bfqe.quantity_estimated) *
100)]
})
Building_Foundation_Walls_Summary.rename(index={0:'Building Foundation Walls Summ
ary'}, inplace=True)
Building_Foundation_Walls_Summary
```

Out[9]:

	SPI	CPI	Budget	Realized Risk	Forecasted Budget	Percent Complete
Building Foundation Walls Summary	0.98	1.02	74200	1750	75950	50.0

In [10]:
```
#Building Foundation Wall Summary Findings
#Access data (update for each Summary)
SPI = Building_Foundation_Walls_Summary.iloc[0,0]
CPI = Building_Foundation_Walls_Summary.iloc[0,1]
BAC = Building_Foundation_Walls_Summary.iloc[0,2]
Realized_Risk = Building_Foundation_Walls_Summary.iloc[0,3]
EAC = Building_Foundation_Walls_Summary.iloc[0,4]
percent_complete = Building_Foundation_Walls_Summary.iloc[0,5]
AC = (percent_complete * EAC) / 100
ETC = EAC - AC

#Calculations
EV = (BAC * percent_complete) / 100
EAC1 = round(BAC / CPI,2)
EAC2 = (AC + (BAC - EV))
EAC3 = round((AC + (BAC - EV) / CPI),2)
EAC4 = round((AC + (BAC - EV) / (CPI * SPI)),)
EAC5 = (AC + ETC)
SPI2 = round(EV / AC,2)
CPI2 = round(AC / EV,2)

#Print to check calc and inputs
print(SPI,CPI,BAC,Realized_Risk,EAC,ETC,EV,EAC1,EAC2,EAC3,EAC4,EAC5,SPI2,CPI2)

#Risk impact add in future
"""
material_delay_risk = (materials * (7 * schedule_delay_cost))
labour_delay_risk = (labour * (7 * schedule_delay_cost))
equipment_delay_risk = (equipment_delay * (7 * schedule_delay_cost))
average = ( material_delay_risk + labour_delay_risk + equipment_delay_risk)/3
impact_contingency_minimum = (communication_risk/communication_channels) * averag
e
"""
#Change from object float into a new dataframe
df3 = [{
    'SPI' : Building_Foundation_Walls_Summary.iloc[0,0],
    'CPI' : Building_Foundation_Walls_Summary.iloc[0,1],
    'BAC' : Building_Foundation_Walls_Summary.iloc[0,2],
    'Realized Risk': Building_Foundation_Walls_Summary.iloc[0,3],
    'EAC' : Building_Foundation_Walls_Summary.iloc[0,4],
    'Actual Costs' : AC,
    'ETC' : ETC,
    'EV' : EV,
    'EAC1' : EAC1,
    'EAC2' : EAC2,
    'EAC3' : EAC3,
    'EAC4' : EAC4,
    'EAC5' : EAC5,
    'SPI2' : SPI2,
    'CPI2' : CPI2}]

Building_Foundation_Walls_Summary_Output = pd.DataFrame(df3)
Building_Foundation_Walls_Summary_Output.rename(index={0:'Building Foundation Wal
ls Summary Output'}, inplace=True)
Building_Foundation_Walls_Summary_Output
```

```
0.98 1.02 74200 1750 75950 37975.0 37100.0 72745.1 75075.0 74347.55 75090.0
75950.0 0.98 1.02
```

Out[10]:

	Actual Costs	BAC	CPI	CPI2	EAC	EAC1	EAC2	EAC3	EAC4	EAC5	ETC	EV
Building Foundation Walls Summary Output	37975.0	74200	1.02	1.02	75950	72745.1	75075.0	74347.55	75090.0	75950.0	37975.0	37100.0

In [11]:
```
#Create building slabs summary dataframe
bfqi = Summary(quantity_installed = df.iloc[3,2])
bfqe = Summary(quantity_estimated = df.iloc[3,1])
Building_Slabs_Summary = pd.DataFrame({
    'SPI' : [bfqi.SPI()] ,
    'CPI' : [bfqi.CPI()],
    'Budget' : [bfqe.account_budget()],
    'Realized Risk' : [(bfqe.forecast_budget() - bfqe.account_budget())],
    'Forecasted Budget': [bfqe.forecast_budget()] ,
    'Percent Complete': [round(((bfqi.quantity_installed/bfqe.quantity_estimated)
* 100),2)]
})
Building_Slabs_Summary.rename(index={0:'Building Slabs Summary'}, inplace=True)
Building_Slabs_Summary
```

Out[11]:

	SPI	CPI	Budget	Realized Risk	Forecasted Budget	Percent Complete
Building Slabs Summary	0.98	1.02	153700	3625	157325	47.72

In [12]:
```
#Building Foundation Wall Summary Findings
#Access data (update for each Summary)
SPI = Building_Slabs_Summary.iloc[0,0]
CPI = Building_Slabs_Summary.iloc[0,1]
BAC = Building_Slabs_Summary.iloc[0,2]
Realized_Risk = Building_Slabs_Summary.iloc[0,3]
EAC = Building_Slabs_Summary.iloc[0,4]
percent_complete = Building_Slabs_Summary.iloc[0,5]
AC = (percent_complete * EAC) / 100
ETC = EAC - AC

#Calculations
EV = (BAC * percent_complete) / 100
EAC1 = round(BAC / CPI,2)
EAC2 = (AC + (BAC - EV))
EAC3 = round((AC + (BAC - EV) / CPI),2)
EAC4 = round((AC + (BAC - EV) / (CPI * SPI)),)
EAC5 = (AC + ETC)
SPI2 = round(EV / AC,2)
CPI2 = round(AC / EV,2)

#Print to check calc and inputs
print(SPI,CPI,BAC,Realized_Risk,EAC,ETC,EV,EAC1,EAC2,EAC3,EAC4,EAC5,SPI2,CPI2)

#Risk impact add in future
"""
material_delay_risk = (materials * (7 * schedule_delay_cost))
labour_delay_risk = (labour * (7 * schedule_delay_cost))
equipment_delay_risk = (equipment_delay * (7 * schedule_delay_cost))
average = ( material_delay_risk + labour_delay_risk + equipment_delay_risk)/3
impact_contingency_minimum = (communication_risk/communication_channels) * averag
e
"""
#Change from object float into a new dataframe
df4 = [{
    'SPI' : Building_Slabs_Summary.iloc[0,0],
    'CPI' : Building_Slabs_Summary.iloc[0,1],
    'BAC' : Building_Slabs_Summary.iloc[0,2],
    'Realized Risk': Building_Slabs_Summary.iloc[0,3],
    'EAC' : Building_Slabs_Summary.iloc[0,4],
    'Actual Costs' : AC,
    'ETC' : ETC,
    'EV' : EV,
    'EAC1' : EAC1,
    'EAC2' : EAC2,
    'EAC3' : EAC3,
    'EAC4' : EAC4,
    'EAC5' : EAC5,
    'SPI2' : SPI2,
    'CPI2' : CPI2}]

Building_Slabs_Summary_Output = pd.DataFrame(df4)
Building_Slabs_Summary_Output.rename(index={0:'Building Slabs Summary Output'}, i
nplace=True)
Building_Slabs_Summary_Output
```

```
0.98 1.02 153700 3625 157325 82249.51 73345.64 150686.27 155429.85 153854.27
155462.0 157325.0 0.98 1.02
```

Out[12]:

	Actual Costs	BAC	CPI	CPI2	EAC	EAC1	EAC2	EAC3	EAC4	EAC5	ETC
Building Slabs Summary Output	75075.49	153700	1.02	1.02	157325	150686.27	155429.85	153854.27	155462.0	157325.0	82249.5

In [13]:
```
#Create stairs & landings summary dataframe
bfqi = Summary(quantity_installed = df.iloc[4,2])
bfqe = Summary(quantity_estimated = df.iloc[4,1])
Stairs_Landings_Summary = pd.DataFrame({
    'SPI' : [1.0] ,
    'CPI' : [1.0],
    'Budget' : [bfqe.account_budget()],
    'Realized Risk' : [(bfqe.forecast_budget() - bfqe.account_budget())],
    'Forecasted Budget': [bfqe.forecast_budget()] ,
    'Percent Complete': [((bfqi.quantity_installed/bfqe.quantity_estimated) *
100)]
})
Stairs_Landings_Summary.rename(index={0:'Stairs & Landings Summary'}, inplace=Tru
e)
Stairs_Landings_Summary
```

Out[13]:

	SPI	CPI	Budget	Realized Risk	Forecasted Budget	Percent Complete
Stairs & Landings Summary	1.0	1.0	1272	30	1302	0.0

In [14]:
```
#Building Foundation Wall Summary Findings
#Access data (update for each Summary)
SPI = Stairs_Landings_Summary.iloc[0,0]
CPI = Stairs_Landings_Summary.iloc[0,1]
BAC = Stairs_Landings_Summary.iloc[0,2]
Realized_Risk = Stairs_Landings_Summary.iloc[0,3]
EAC = Stairs_Landings_Summary.iloc[0,4]
percent_complete = Stairs_Landings_Summary.iloc[0,5]
AC = (percent_complete * EAC) / 100
ETC = EAC - AC

#Calculations
EV = (BAC * percent_complete) / 100
EAC1 = round(BAC / CPI,2)
EAC2 = (AC + (BAC - EV))
EAC3 = round((AC + (BAC - EV) / CPI),2)
EAC4 = round((AC + (BAC - EV) / (CPI * SPI)),)
EAC5 = (AC + ETC)
SPI2 = 1 #round(EV / AC,2)
CPI2 = 1 #round(AC / EV,2)

#Print to check calc and inputs
print(SPI,CPI,BAC,Realized_Risk,EAC,ETC,EV,EAC1,EAC2,EAC3,EAC4,EAC5,SPI2,CPI2)

#Risk impact add in future
"""
material_delay_risk = (materials * (7 * schedule_delay_cost))
labour_delay_risk = (labour * (7 * schedule_delay_cost))
equipment_delay_risk = (equipment_delay * (7 * schedule_delay_cost))
average = ( material_delay_risk + labour_delay_risk + equipment_delay_risk)/3
impact_contingency_minimum = (communication_risk/communication_channels) * averag
e
"""
#Change from object float into a new dataframe
df5 = [{
    'SPI' : Stairs_Landings_Summary.iloc[0,0],
    'CPI' : Stairs_Landings_Summary.iloc[0,1],
    'BAC' : Stairs_Landings_Summary.iloc[0,2],
    'Realized Risk': Stairs_Landings_Summary.iloc[0,3],
    'EAC' : Stairs_Landings_Summary.iloc[0,4],
    'Actual Costs' : AC,
    'ETC' : ETC,
    'EV' : EV,
    'EAC1' : EAC1,
    'EAC2' : EAC2,
    'EAC3' : EAC3,
    'EAC4' : EAC4,
    'EAC5' : EAC5,
    'SPI2' : 1,
    'CPI2' : 1}]

Stairs_Landings_Summary_Output = pd.DataFrame(df5)
Stairs_Landings_Summary_Output.rename(index={0:'Stairs Landings Summary Output'},
inplace=True)
Stairs_Landings_Summary_Output
```

```
1.0 1.0 1272 30 1302 1302.0 0.0 1272.0 1272.0 1272.0 1272.0 1302.0 1 1
```

Out[14]:

	Actual Costs	BAC	CPI	CPI2	EAC	EAC1	EAC2	EAC3	EAC4	EAC5	ETC	EV	Realized Risk	SPI	S
Stairs Landings Summary Output	0.0	1272	1.0	1	1302	1272.0	1272.0	1272.0	1272.0	1302.0	1302.0	0.0	30	1.0	

In [15]:
```
sub_task_summary = pd.concat([Continous_Footings_Summary,
                              Spot_Footings_Summary,
                              Building_Foundation_Walls_Summary,
                              Building_Slabs_Summary,
                              Stairs_Landings_Summary], ignore_index=False)

sub_task_summary
```

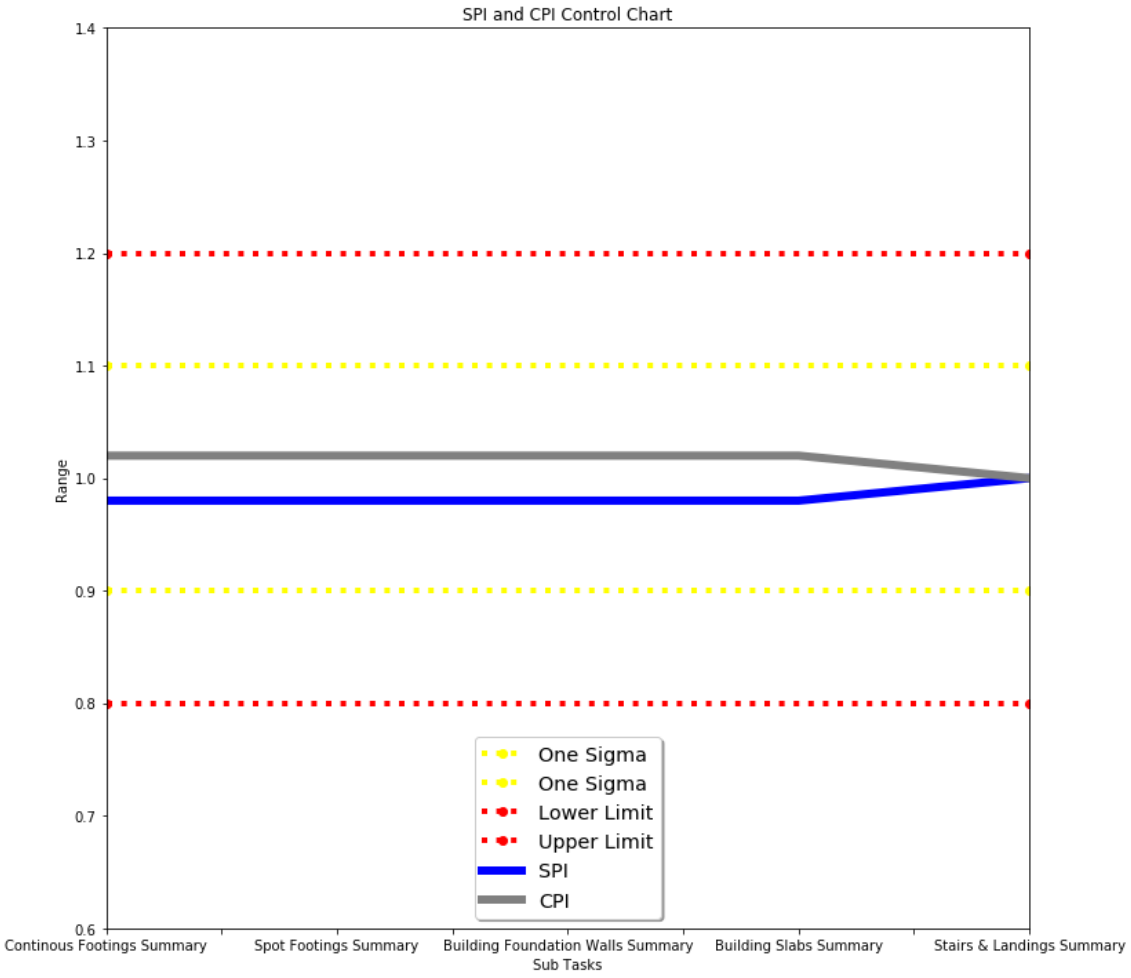
Out[15]:

	SPI	CPI	Budget	Realized Risk	Forecasted Budget	Percent Complete
Continous Footings Summary	0.98	1.02	10600	250	10850	70.00
Spot Footings Summary	0.98	1.02	42400	1000	43400	62.50
Building Foundation Walls Summary	0.98	1.02	74200	1750	75950	50.00
Building Slabs Summary	0.98	1.02	153700	3625	157325	47.72
Stairs & Landings Summary	1.00	1.00	1272	30	1302	0.00

In [23]:
```
title = "SPI and CPI Control Chart"
xlabel = 'Sub Tasks'
ylabel = 'Range'
```

In [24]:
```
x1, y1 = [0, 4], [0.9, .9]
x2, y2 = [0, 4], [1.1, 1.1]
plt.plot(x1, y1, x2, y2, marker = 'o',c='yellow',ls=':',lw='4')
x3, y3 = [0, 4], [0.8, .8]
x4, y4 = [0, 4], [1.2, 1.2]
plt.plot(x3, y3, x4, y4, marker = 'o',c='red',ls=':',lw='4')
plt.xlim([0, 4])
plt.ylim([.6, 1.4])
p2 = sub_task_summary['SPI'].plot(figsize=(12,12),ls='-',c='Blue',lw='6')
p3 = sub_task_summary['CPI'].plot(figsize=(12,12),ls='-',c='grey',lw='6')
p2.set(title=title,xlabel=xlabel,ylabel=ylabel)
p2.legend(['One Sigma','One Sigma','Lower Limit','Upper Limit','SPI','CPI'],loc='
lower center', shadow=True, fontsize='x-large')
```

Out[24]: <matplotlib.legend.Legend at 0x1a3a06df60>



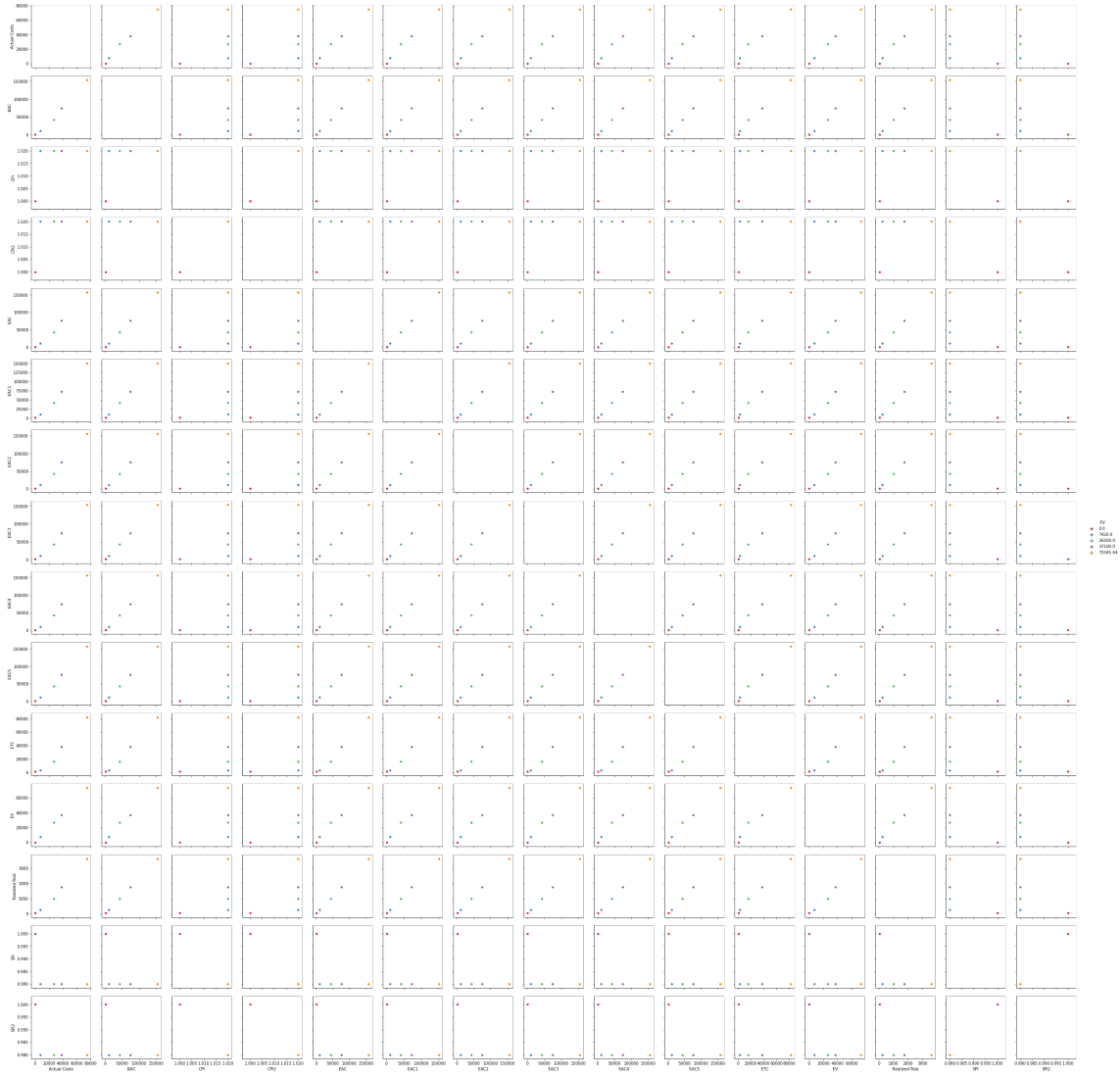
In [16]:
```
sub_task_summary_Output = pd.concat([Continous_Footings_Summary_Output,
                                     Spot_Footings_Summary_Output,
                                     Building_Foundation_Walls_Summary_Output,
                                     Building_Slabs_Summary_Output,
                                     Stairs_Landings_Summary_Output], ignore_index=Fals
e)

sub_task_summary_Output
```

Out[16]:

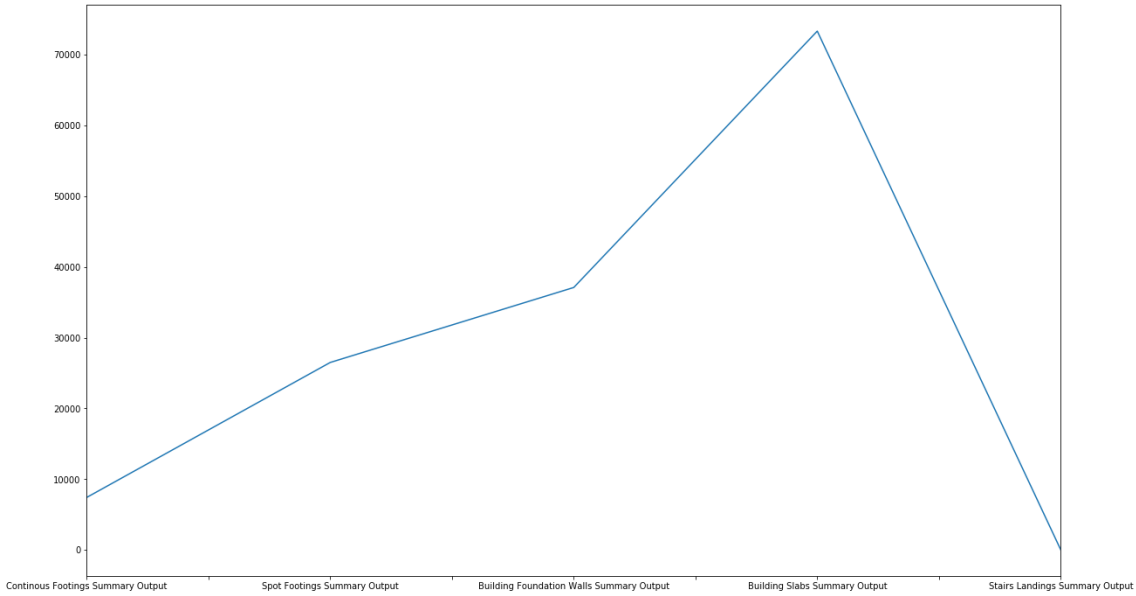
	Actual Costs	BAC	CPI	CPI2	EAC	EAC1	EAC2	EAC3	EAC4	EAC5	E
Continous Footings Summary Output	7595.00	10600	1.02	1.02	10850	10392.16	10775.00	10712.65	10776.0	10850.0	3255
Spot Footings Summary Output	27125.00	42400	1.02	1.02	43400	41568.63	43025.00	42713.24	43031.0	43400.0	16275
Building Foundation Walls Summary Output	37975.00	74200	1.02	1.02	75950	72745.10	75075.00	74347.55	75090.0	75950.0	37975
Building Slabs Summary Output	75075.49	153700	1.02	1.02	157325	150686.27	155429.85	153854.27	155462.0	157325.0	82249
Stairs Landings Summary Output	0.00	1272	1.00	1.00	1302	1272.00	1272.00	1272.00	1272.0	1302.0	1302

In [18]:
```
sns.pairplot(sub_task_summary_Output,hue='EV',palette='Set1')
```

Out[18]: <seaborn.axisgrid.PairGrid at 0x1a2a3378d0>



In [20]:
```
# SIMPLE LINE PLOT
sub_task_summary_Output['EV'].plot(figsize=(20,12));
```



In [26]:
```
```

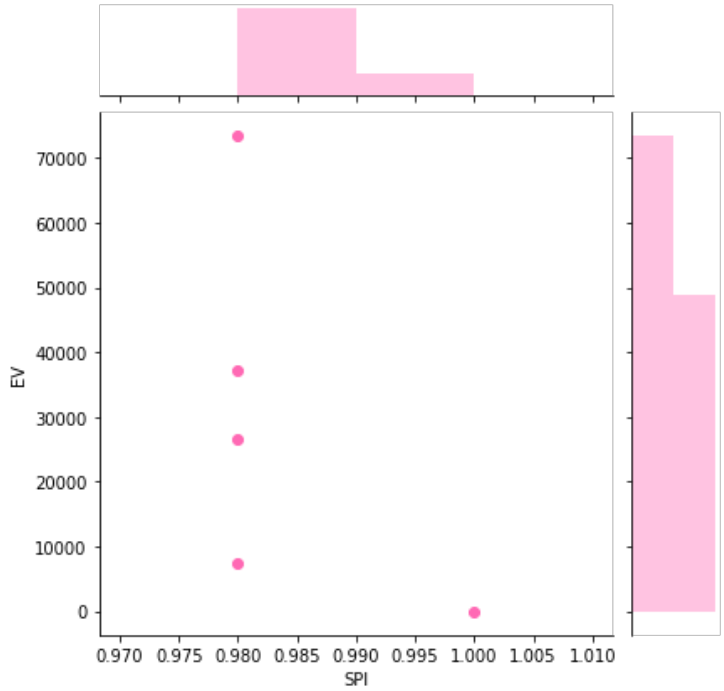
Out[26]:
```
<Figure size 864x576 with 0 Axes>
```

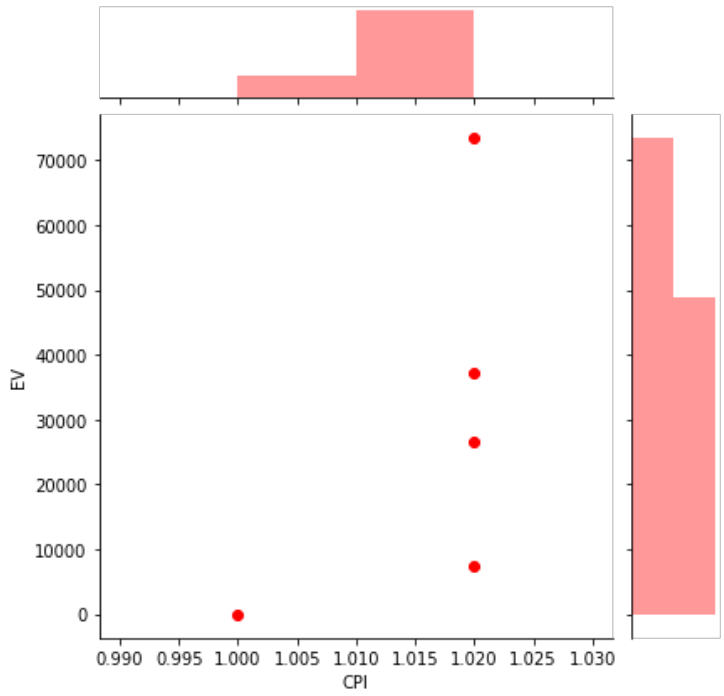
```
<Figure size 864x576 with 0 Axes>
```

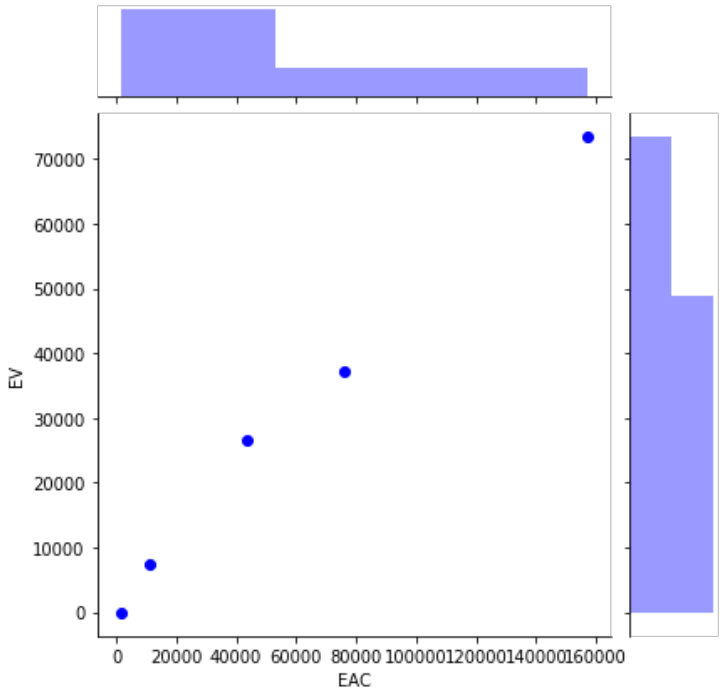
In [65]:
```
plt.figure(figsize=(12,8))

sns.jointplot(x='SPI',y='EV',data=sub_task_summary_Output,color='hotpink')
sns.jointplot(x='CPI',y='EV',data=sub_task_summary_Output,color='red')
sns.jointplot(x='EAC',y='EV',data=sub_task_summary_Output,color='blue')
```

Out[65]: <seaborn.axisgrid.JointGrid at 0x1a3ef67a90>

<Figure size 864x576 with 0 Axes>







In [41]:

In [55]:

In [56]:

In [66]:

In [67]:

In [ ]:

In [ ]: