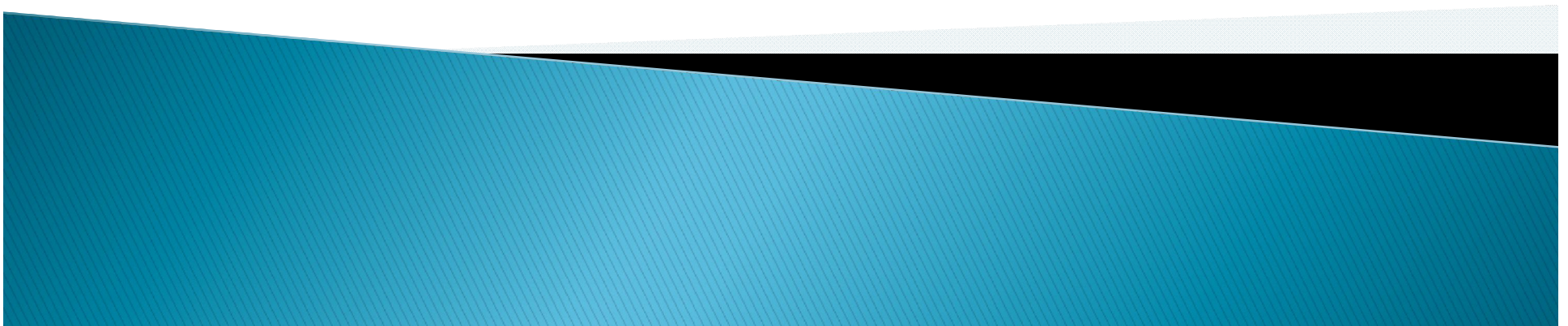


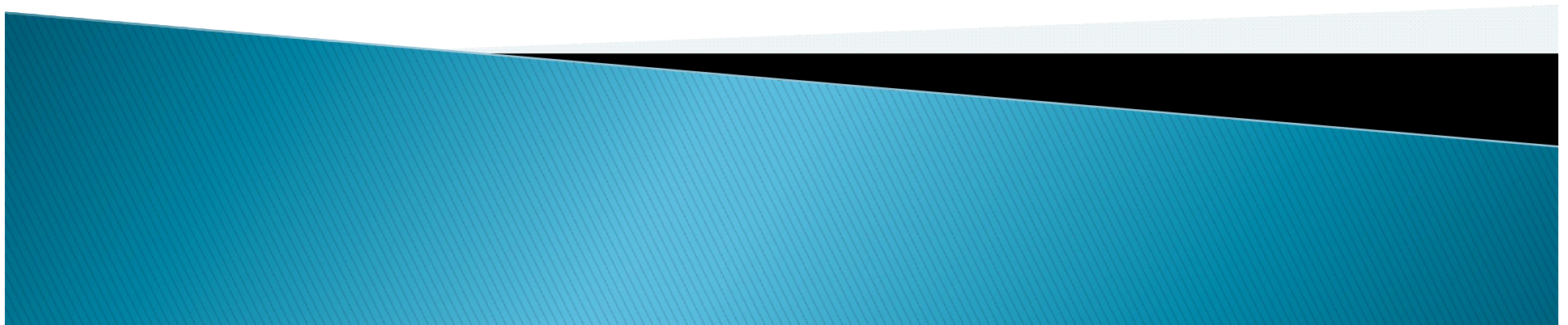
Forecast Comparisons – Proc Univariate and GPlot

Peter Olynyk
Federated Co-operatives Limited



Forecast Comparisons and Exceptions – Proc Univariate and GPlot

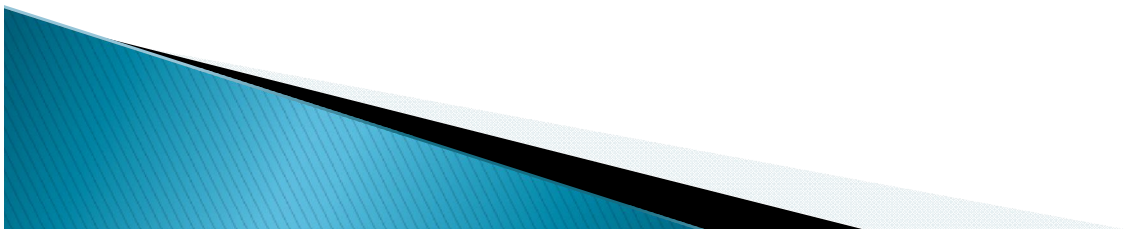
Peter Olynyk
Federated Co-operatives Limited



What We Do...

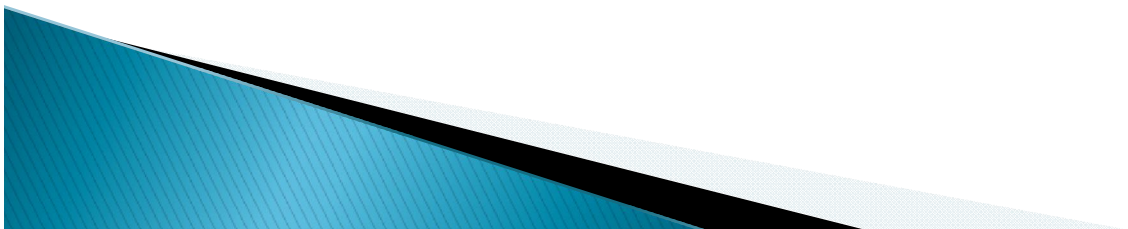
Setting the Stage

- ▶ FCL is a wholesaler that stock grocery and hardware items into our warehouses which in turn supply our retail stores
- ▶ Example: There are 4 FOOD warehouses:
- ▶ Saskatoon, Winnipeg, Edmonton, and Calgary



What We Do...

- ▶ FCL uses a program that reads our data feed (such as 'on-hand qty' and 'weekly demand') to determine an optimal quantity to buy
- ▶ Timing is important



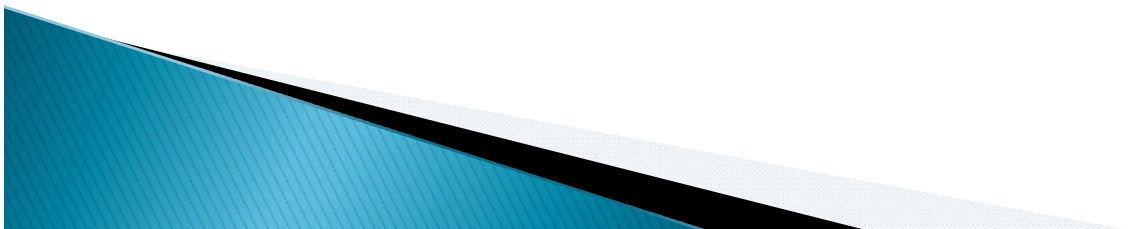
Progress...

Proposition

- ▶ FCL wants to replace this program with another one

Issue

- ▶ How do the old and new programs compare in terms of 'suggested buy quantities'?



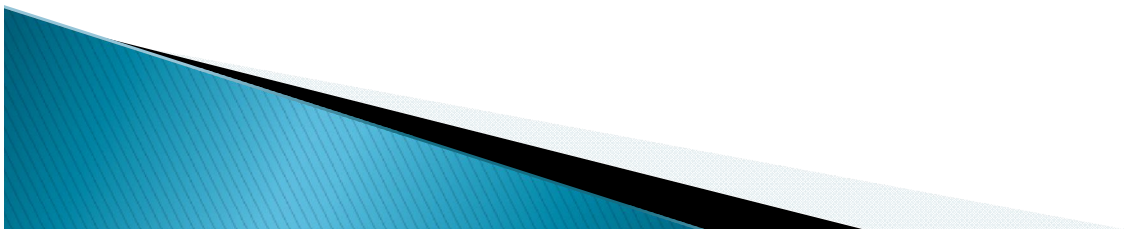
Unexpected...

Noticed Differences

The outcomes in 'suggested buy quantities'
were different
...very different

Why?

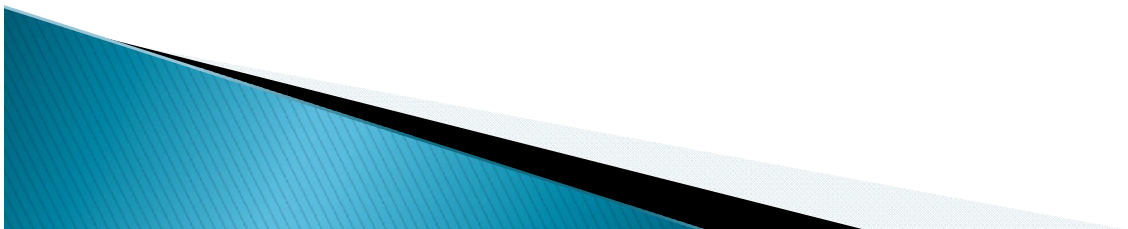
(we do expect a few differences for various reasons)



Identify...

Next Steps

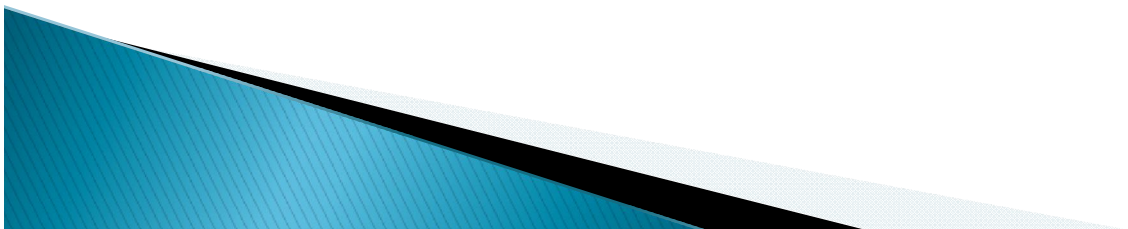
- ▶ Take the forecasts from the new program and determine what causes for the differences



Challenge...

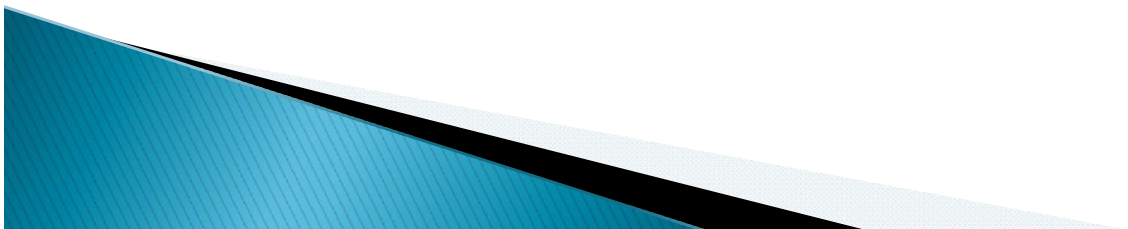
SAS Program

1. Set up the data (forecasts)
2. Set up the statistics (mean and standard deviation)
3. Build criteria - “At what point would you expect to find outliers?”
4. Graph the data to visually spot the issues (may help find patterns at certain times of the year)



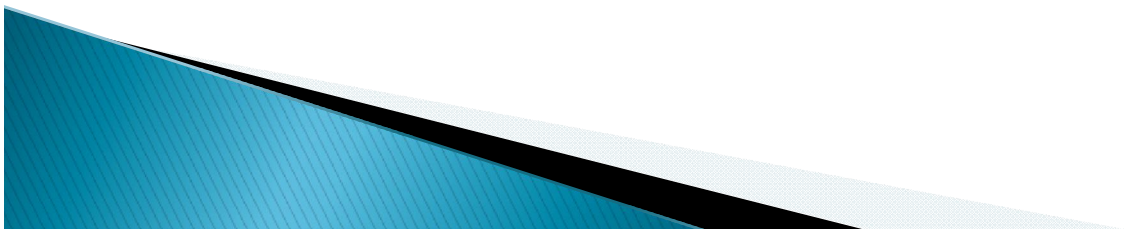
SAS Program

```
Proc Univariate data=FcstBase noprint ;***Gather the mean and standard deviation ;
    By DmdUnit Loc ;
    Var Qty ;
    Output out=FcstStats mean=QtyM std=QtyS
    ;
Run ;
Data FcstStats2 ;                               ***Delete zeroes and blanks ;
    Set FcstStats ;
    If QtyM=0 then delete ;
    If QtyS in (0, .) then delete ;
Run ;
Data FcstBase2 ;                               ***Merge Forecast with Statistics ;
    Merge      FcstBase          (in=i1)
              FcstStats2       (in=i2)
              ;
    By DmdUnit Loc ;
    If i1 and i2 ;
Run ;
```



SAS Program

```
Data BadFcst ; ***Identify obvious errors ;  
    Set FcstBase2 ;  
    If (QtyM > 10) and (Qty > (QtyM + (3*QtyS))) and (Qty > (10*QtyM))  
    then output ;  
Run ;  
  
***bad forecast where  
    Mean > 10 and  
    Fcst > 3 STD above Mean and  
    Fcst > 10 times the Mean  
    ;
```



SAS Program

```
Data BadFcst2 (Keep=DmdUnit Loc) ;  
    Set BadFcst ;  
    By DmdUnit Loc ;  
    If First.Loc then output ;
```

```
Run ;
```

```
Data FcstBase3 ;  
    Merge FcstBase2(in=i1)  
          BadFcst2 (in=i2)  
          ;  
    By DmdUnit Loc ;  
    If i1 and i2 ;
```

```
Run ;
```

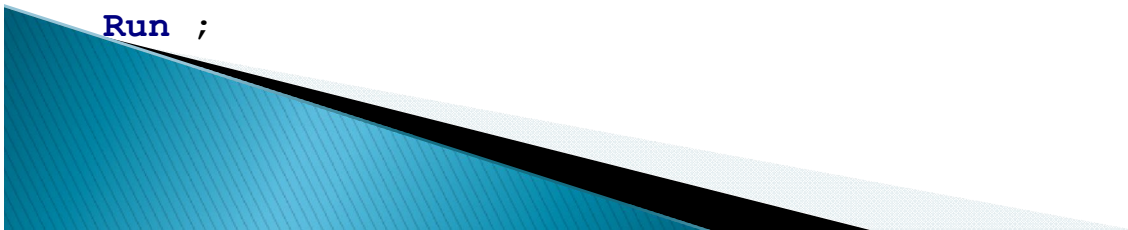
```
Data FcstGraph ;  
    Set FcstBase3 ;  
    Attrib  
          FcstDate Format=Date7.  
          Fcst      Format=8.1  
          Item      Format=z7.    Label='Item'  
          ;  
    FcstDate = DatePart(StartDate) ;  
    Fcst = QTY ;  
    Item = DmdUnit ;  
    Drop FcstId StartDate Dur Type QTY ;
```

```
Run ;
```

```
***List out items at a Location ;
```

```
***Create a simple list of items ;
```

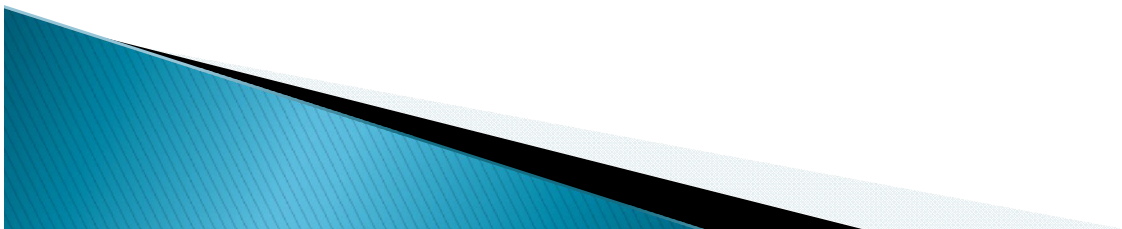
```
***Simple data set for graphing ;
```



SAS Program

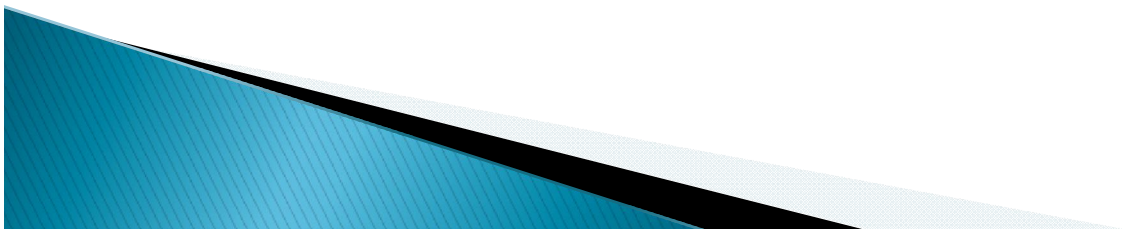
```
*** Generate Graphs ;
TITLE2 'Problem forecasts' ;
TITLE3 'MEAN > 10, QTY > (MEAN + 3 SD), QTY > 10*MEAN' ;
Symbol1 ci=red cv=red interpol=join value=none height=2 width=3 line=3 ;
Symbol2 ci=black cv=black interpol=join value=none height=2 width=3 ;
Axis1 Order = ('01Apr2010'd to "&PlotEnd"d by Month)
          major=(height=3 width=2)
          minor=(height=2 width=1)
          offset=(3,3)
          ;
Axis2 order=0
          ;
Axis2 Label=('Forecast') ;
Legend1 label=none ;

Options Orientation = Landscape ;
Ods proclabel = ' ' ;
Ods Pdf File = "&RptFolder.ProblemForecasts.pdf" ;
```



SAS Program

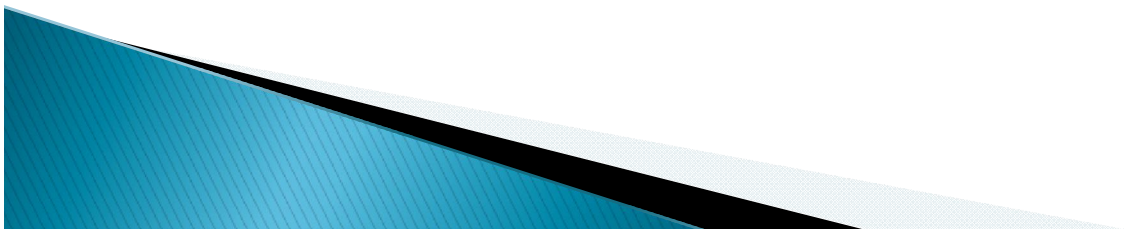
```
Proc GPlot Data=FcstGraph3 ;  
  By FimBuyerCd VendDesc Loc Item ;  
  Where FcstDate <= "&PlotEnd"d ;  
  Label  
      Fcst          = 'Forecast'  
      FcstDate      = 'Date'  
  ;  
  Plot  
      Fcst * FcstDate  
      / Overlay legend=legend1  
      haxis = axis1  
      vaxis = axis2  
  ;  
Run ;  
  
Quit ;  
  
Ods PDF Close ;
```



Interpret...

Graphs

- ▶ From the graphs we can identify large “spikes” in the forecasts
- ▶ These turned out to be promotions that are not being masked in the new program
- ▶ [View Graphs from PDF](#)



Next Steps...

Data Cleansing

- ▶ We will have to pass Regular, not Promotional demand into the new system
- ▶ These two types of demand have become combined for certain products at certain times

