SAS® GLOBAL FORUM 2018

USERS PROGRAM

April 8 – 11 | Denver, CO
Colorado Convention Center

#SASGF

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

To Catch a Thief: The Use of Analytics for Employee Fraud Detection

Bruce Bedford, Ph.D.

VP Marketing Analytics & Consumer Insights

Oberweis Dairy, Inc.

Dr. Bedford began his career as a design engineer in the chemical industry. Several years later he founded an analytics consultancy. Oberweis Dairy was a client. After concluding an engagement with Oberweis, he joined the dairy as a Vice President.

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

Returnable Glass Bottles

$1.50 deposit

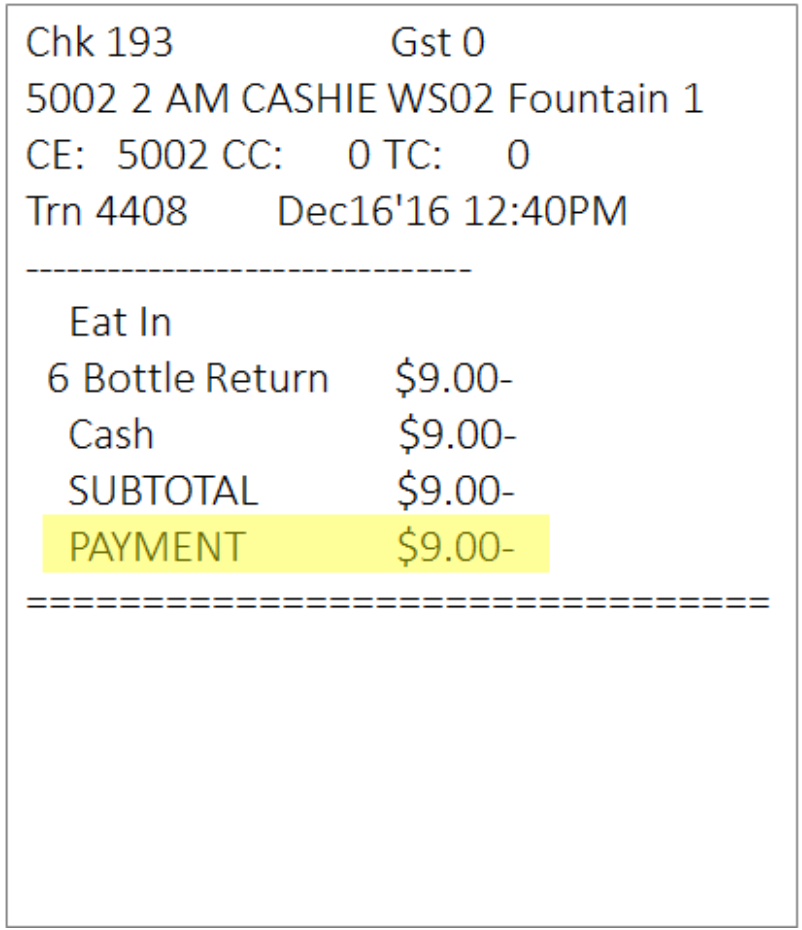
SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

Hey, Bruce, I think we have a problem …

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

CH2 2016/12/18 12:46:36



```
Chk 193                 Gst 0
5002 2 AM CASHIE WS02 Fountain 1
CE:  5002 CC:     0 TC:     0
Trn 4408       Dec16'16 12:40PM
------------------------------
   Eat In
 6 Bottle Return     $9.00-
   Cash              $9.00-
   SUBTOTAL          $9.00-
   PAYMENT           $9.00-
==============================
```


SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

At The Heart of the Detection Algorithm

```
ods output MedianMC=MedianMC
           WilcoxonMC=WilcoxonMC
           KSMC=KSMC
           KuiperStats=KuiperStats
;

proc npar1way data=workGrp plots=none wilcoxon median edf;
    by testId;
    class group;
    var Qty;
    exact median wilcoxon edf / n=40000;
run;
```


SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

Now Just Append All ODS Output Tables

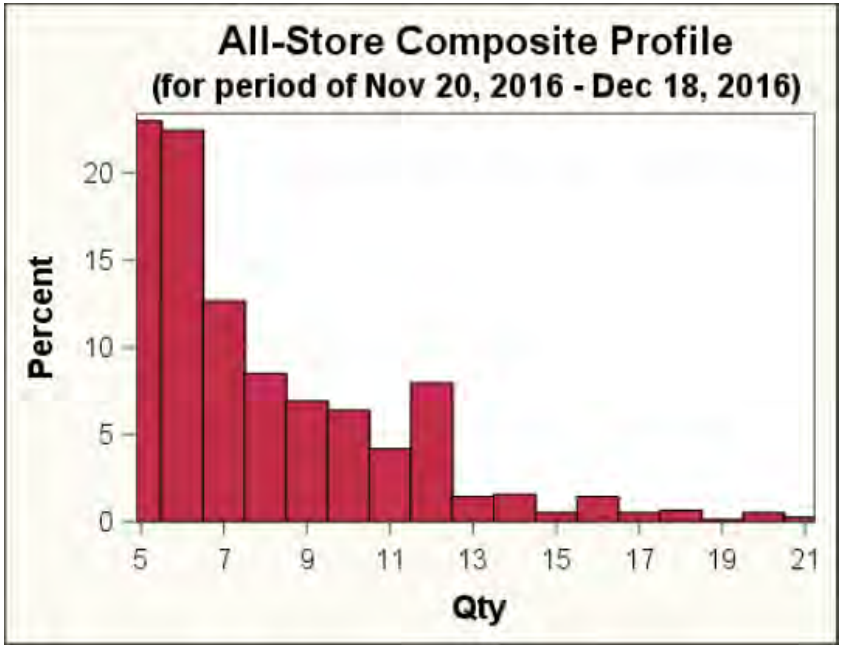
```
proc sql;
    create table ExactTests_U as
    select TestID, name1 as Stat, nvalue1 as P from WilcoxonMC where name1="MCP2_WIL"
        union all
    select TestID, name1 as Stat, nvalue1 as P from MedianMC where name1="MCP2_MED"
        union all
    select TestID, name1 as Stat, nvalue1 as P from KSMC where name1="MCP_D"
        union all
    select TestID, name3 as Stat, nvalue3 as P from KuiperStats where name3="P_KA"
    order by TestID, Stat, P
;
quit;
```

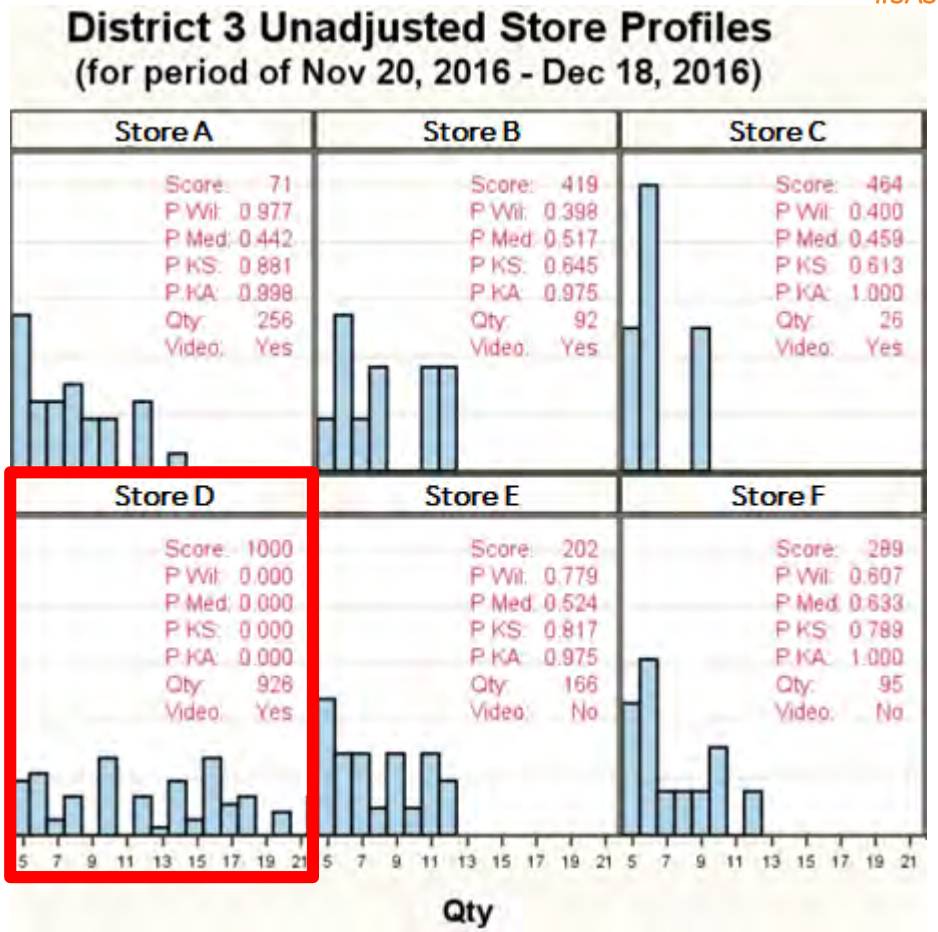

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

“Suspect Score” = 1000 * (1 – Median P)

testID	Stat	P	
H	MCP2_MED	0.792775	Suspect Score = 241
H	MCP2_WIL	0.5733	
H	MCP_D	0.725775	
H	P_KA	0.9999971561	
I	MCP2_MED	0.810675	Suspect Score = 223
I	MCP2_WIL	0.9982	
I	MCP_D	0.524175	
I	P_KA	0.7428287089	
J	MCP2_MED	0.05475	Suspect Score = 948
J	MCP2_WIL	0.020775	
J	MCP_D	0.049975	
J	P_KA	0.3804249924	

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

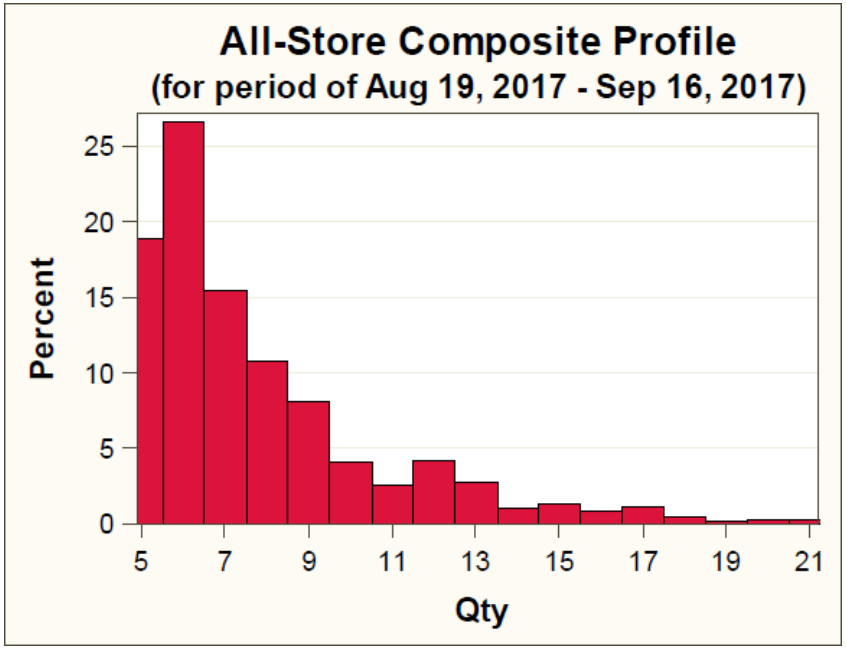


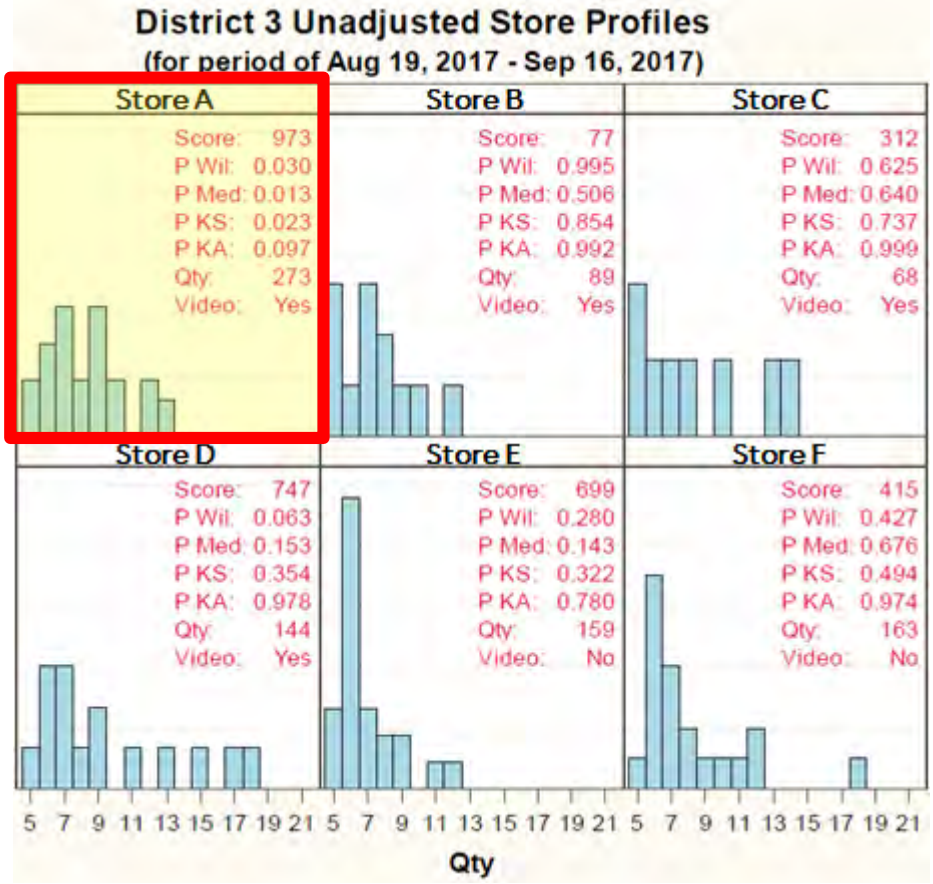


SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

Caught by Analytics … and On Camera

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.





SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

4:15 – 5.21

OBERWEIS DAIRY

Order #

91

5021 11 PM CA

Chk 91 Aug21'17 09:34P Gst 0

To Go

12 Bottle Return @ 1.50- 18.00-
Cash 18.00-

SUBTOTAL 18.00-
PAYMENT 18.00-

TRY A SCOOP

OF OUR ALL NEW

DARK CHOCOLATE

SEA SALT CARAMEL ICE CREAM

Tell us about your visit at
oberweis.com/tellus

OBERWEIS DAIRY

Order #

820

5022 22 PM CA

Chk 820 Sep11'17 09:20P Gst 0

Eat In

7 Bottle Return @ 1.50- 10.50-
Cash 10.50-

SUBTOTAL 10.50-
PAYMENT 10.50-

Seasonal favorite

Apple Crisp Sundaes

are Back!

Tell us about your visit at
oberweis.com/tellus

OBERWEIS DAIRY

Order #

822

5021 11 PM CA

Chk 822 Sep11'17 09:22P Gst 0

To Go

12 Bottle Return @ 1.50- 18.00-
Cash 18.00-

SUBTOTAL 18.00-
PAYMENT 18.00-

Seasonal favorite

Apple Crisp Sundaes

are Back!

Tell us about your visit at
oberweis.com/tellus

OBERWEIS DAIRY

Order #

1658

5021 11 PM CA

Chk 1658 Sep15'17 10:54P Gst 0

To Go

10 Bottle Return @ 1.50- 15.00-
Cash 15.00-

SUBTOTAL 15.00-
PAYMENT 15.00-

Seasonal favorite

Apple Crisp Sundaes

are Back!

Tell us about your visit at
oberweis.com/tellus

09-15-2017 Fri 11:02:00 PM (S)
Office

A Difficult Ending

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

09-19-2017 Tue 04:06:30 PM (S)
Office

09-19-2017 Tue 04:07:30 PM (S)
EXIT
Front Entrance 1

Your Feedback Counts!

Don't forget to complete the session survey
in your conference mobile app.

1. Go to the Agenda icon in the conference app.
2. Find this session title and select it.
3. On the Sessions page, scroll down to Surveys and select the name of the survey.
4. Complete the survey and click Finish.

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.