



AARHUS SCHOOL OF BUSINESS  
AARHUS UNIVERSITY

## IT Course for Advanced Corporate Finance

Analytics Group

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# Agenda

Very brief introduction to an event study

- Zephyr → Locate the events
- Datastream → Find Stock data
- SAS → Doing the statistical tests

All topics will be covered by a program introduction.

# Event Study

- Event studies are a way to investigate how the market responds to new information
- The purpose of an event study is to investigate the economic consequence of an event as measured by a change in price of a traded asset

## What events?

- Company specific announcements: earnings announcement, debt issuance, stock splits, dividend announcements, mergers & acquisitions
- It could also be market wide events. Changes in regulation (example Basel II) or the announcement of key macroeconomic figures (inflation, consumption etc.).
- Test the Null hypothesis

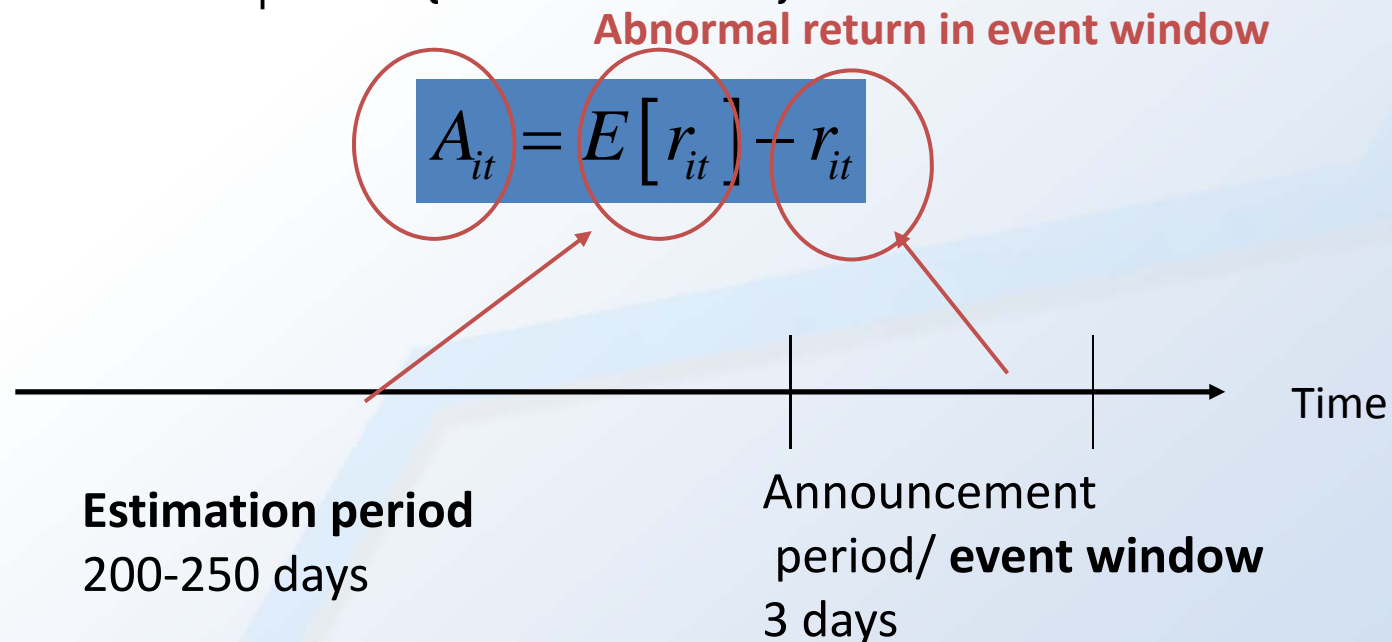
**$H_0$ : event has no impact on abnormal returns in the event window**

**Or (written in another way)**

**$H_0$ : Event has no impact on the distribution of returns**

# Measurement of abnormal return

- We estimate the expected return before the public announcement (estimation period)
- We estimate the abnormal return for each days in the announcement period (event window)



# Event window

- We calculate abnormal returns for each day in the event window (normally three days):

$$A_{it} = E[r_{it}] - r_{it}, t = -1, 0, 1$$

- $t=-1$ : The day before the official announcement day
- $t=0$ : The official announcement day
- $T=+1$ : Day after the official announcement day
- Then form test statistic to test for significance of the event (more on this later)

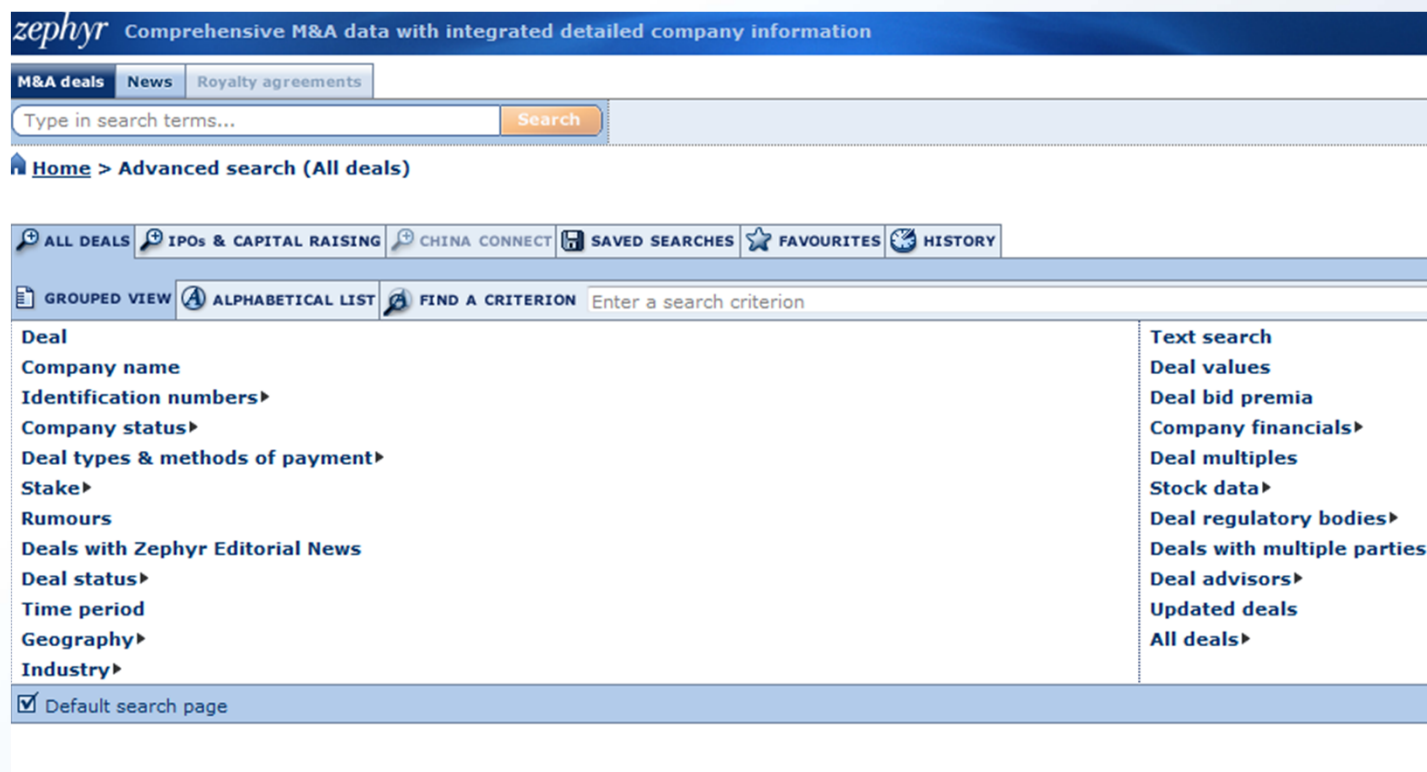
# Zephyr

- Database with mergers, acquisitions, IPOs and venture capital transactions.
- “Zephyr contains detailed information on M&A, IPO and venture capital deals with links detailed financial company information. The database has 5 years global coverage but the coverage of deals involving European and American companies goes back to 1997. Zephyr includes almost 600,000 transactions (June 2008) and up to 100,000 deals are added each year.”
- Access through the library’s database page ([lib.asb.dk](http://lib.asb.dk))
- From home: [www.baser.dk](http://www.baser.dk)

Depending on your which site you choose to connect, the interface will look rather different.

# Zephyr

## Zephyr through lib.asb.dk (new version)



The screenshot shows the Zephyr web interface. At the top, there's a blue header with the Zephyr logo and the text "Comprehensive M&A data with integrated detailed company information". Below this is a navigation bar with tabs for "M&A deals", "News", and "Royalty agreements". A search bar with the placeholder "Type in search terms..." and a "Search" button is located below the tabs. The main content area has a breadcrumb trail: "Home > Advanced search (All deals)". Below this is a horizontal menu with icons and labels for "ALL DEALS", "IPOs & CAPITAL RAISING", "CHINA CONNECT", "SAVED SEARCHES", "FAVOURITES", and "HISTORY". Under "ALL DEALS", there are three sub-tabs: "GROUPED VIEW", "ALPHABETICAL LIST", and "FIND A CRITERION". The "FIND A CRITERION" tab is active, showing a search criterion input field. The search results are displayed in a table with two columns. The left column lists various deal attributes with expandable arrows, and the right column lists specific deal types and filters.

Deal	Text search
Company name	Deal values
Identification numbers▶	Deal bid premia
Company status▶	Company financials▶
Deal types & methods of payment▶	Deal multiples
Stake▶	Stock data▶
Rumours	Deal regulatory bodies▶
Deals with Zephyr Editorial News	Deals with multiple parties
Deal status▶	Deal advisors▶
Time period	Updated deals
Geography▶	All deals▶
Industry▶	

☒ Default search page

See more at [www.asb.dk/aq](http://www.asb.dk/aq)

# Zephyr

## Zephyr through baser.dk (old version)

**ZEPHYR** - Deal information in an instant

[Search](#)
[List of Deals](#)
[Summary Records](#)
[Complete Records](#)
[League Tables](#)
[Analyses & Overview](#)

[Quick Deal search](#)  
[Advanced Deal search](#)

Search Criteria Locator

- ☐ Company Name
- ☒ Company/Deal ID Number
- ☒ Buy/Sell rumours
- ☒ Activity
  - ☐ Text search
  - ☐ Time period
  - ☒ Geography
  - ☐ Current deal status
  - ☒ Deal type & method of payment
  - ☒ Stake
  - ☐ Deal values
  - ☐ Bid premium
  - ☒ Deal multiples
  - ☒ Financials
  - ☐ Quoted companies
  - ☒ Stock Data
  - ☒ Advisor
  - ☐ Regulatory Body
  - ☒ Company
  - ☐ Deals with multiple parties
  - ☐ Updated deals
  - ☒ Load a file
  - ☐ Load a search
- [Deals with Zephyr Editorial](#)
- [News related to my searches](#)

**Search summary**

		Selected criteria	Specific
1.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Deal value (incl. Est.) (million EUR)	All deals with a known value

☒ All ANDs
 ☐ All ORs
 ☐ Other Boolean search





☒ Delete the search step  
☒ Modify the search step  
☒ Activate or deactivate the search step

See more at [www.asb.dk/aq](http://www.asb.dk/aq)



# Zephyr – event example

- Issue: We need a number of events and information regarding the company involved and the date for the event.
- Example: **Effect on the acquirer of a take over.**
- Selection criteria:
  - Danish and quoted acquirer
  - Minimum deal value = 500 million € and the value have to be known
  - Time period: 2004 until now

SEARCH STRATEGY		 Alert me	 Save	 Print	 Clear all steps
X <input checked="" type="checkbox"/>	1. <u>Country: Denmark (DK) (6) ( Acquiror )</u>				6,898
X <input checked="" type="checkbox"/>	2. <u>Deal type: Acquisition</u>				342,918
X <input checked="" type="checkbox"/>	3. <u>Listed/Unlisted companies: listed acquiror</u>				196,749
X <input checked="" type="checkbox"/>	4. <u>Deal value: min :500 mil EUR (including estimates)</u>				16,303
X <input checked="" type="checkbox"/>	5. <u>Deal value: all deals with known value in EUR (including estimates)</u>				456,507
X <input checked="" type="checkbox"/>	6. <u>Time period: 2004 - Until current date (rumoured, completed, announced)</u>				631,329
<input checked="" type="radio"/> Boolean search <input type="text" value="1 And 2 And 3 And 4 And 5 And 6"/> <input type="button" value="Refresh"/> <input type="button" value="?"/>					TOTAL : 9
<input type="button" value="Launch wizard"/> <input type="button" value="View list of deals"/>					

# Zephyr – event example

Click on  and the list of the 9 deals are listed as seen below.

Check each deal to see whether or not these are in coherence with the filter from the past slide.

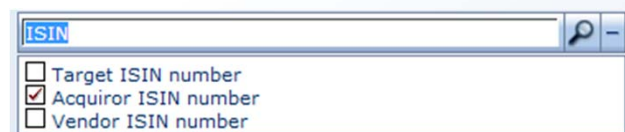
9 Deals				€ Currency	Columns	Save	Delete	Export	Send	Print
			Deal Number	Acquiror name	Acquiror country code	Target name				
1.	X	<input type="checkbox"/>	<a href="#">126520</a>	DANSKE BANK A/S	DK	SAMPO PANKKI OYJ				
2.	X	<input type="checkbox"/>	<a href="#">226879</a>	CARLSBERG A/S	DK	CARLSBERG BREWERIES A/S				
3.	X	<input type="checkbox"/>	<a href="#">531794</a>	TEEKAY SHIPPING CORPORATION	MH	OMI CORPORATION				
4.	X	<input type="checkbox"/>	<a href="#">1601019220</a>	SPAR NORD BANK A/S	DK	BANKAKTIESELSKABET AF AUG. 24, 2008'S				
5.	X	<input checked="" type="checkbox"/>	<a href="#">621591</a>	DSV A/S	DK	XB LUXEMBOURG HOLDINGS 1 SA				
6.	X	<input checked="" type="checkbox"/>	<a href="#">534603</a>	FLSMIDTH & CO A/S	DK	GROUPE LAPERRIÈRE & VERREAULT INC.'S				
7.	X	<input checked="" type="checkbox"/>	<a href="#">427403</a>	FLSMIDTH & CO A/S	DK	POTAGUA FLS A/S				
8.	X	<input checked="" type="checkbox"/>	<a href="#">224121</a>	DANSKE BANK A/S	DK	NATIONAL IRISH BANK LTD				
9.	X	<input checked="" type="checkbox"/>	<a href="#">342764</a>	AP MØLLER-MÆRSK A/S	DK	ROYAL P&O NEDLLOYD NV				

# Zephyr – event example

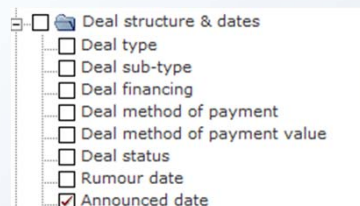
Modify the details to be shown for each deal by clicking on



We want to have the ISIN number of the acquirer in the table, as Datastream is able to obtain the stock prices by having the ISIN number.

A dialog box with a search bar containing "ISIN". Below the search bar are three checkboxes: "Target ISIN number" (unchecked), "Acquiror ISIN number" (checked), and "Vendor ISIN number" (unchecked).

The Announcement date is of interest and should also be displayed in the output.

A dialog box titled "Deal structure & dates" with a list of checkboxes: "Deal type", "Deal sub-type", "Deal financing", "Deal method of payment", "Deal method of payment value", "Deal status", "Rumour date", and "Announced date". The "Announced date" checkbox is checked.

Click on



in order to download the table as an Excel file.

# Datastream

- Datastream can be found on all computers in the computer labs (H and D wing)
- Accessed through:
  - Add-in for Excel
- Database with financial data
- Only a very limited number of users can access data at the same time – might give some problems if all are trying to access data at the same time.
- Please don't open up Datastream during the presentation!

# Data categories

- Equities
- Equity Indices
- Exchange rates
- Commodities
- Interest rates
- Bonds and Convertibles / Bond indices
- Credit Default Swaps
- Economics (growth, inflation etc.)
- I/B/E/S Broker estimates (Datatype: Equities)
- Unit trusts
- Futures/Options

# Excel Add in

- Datastream access through an Excel add-in
- Advantages:
  - Data is delivered directly to the Excel spreadsheet
  - Date format and Danish/English comma style
  - Easy to access data for many instruments at one time
  - Remember to save as macro enabled workbook

# How to add the Add-in

1. Press Excel Options

2. Press Add Ins

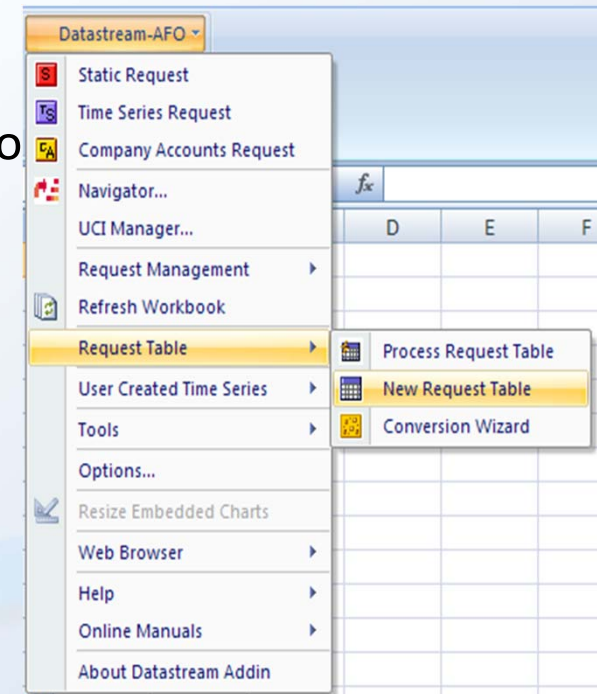
3. Press Go

4. Press Browse.. and open C:\Program Files\Datastream\Datastream Advance\AdvanceOffice.xla





# Request table

- The most usefull tool in Datastream
- Possible to get large amount of data into excel
- Ensures right date and comma type
- Therefore: **always use this tool!**





# How to fill out the request table I

Update	Request Type					Format	Series Lookup
Yes/No	S	TS	TSL	CAF	CH	Select Format	 
YES	TS					HRC	DK:NON, DK:DSV




Should the table be updated when pressing "process table"

Settings for formatting.  
Press "Selct format" to see the possible settings

Which series are requested?  
Press the red arrow to search  
Press the magnifier to use a list

S	=	Static data request
TS	=	Time series data request
TSL	=	Time series list data request (used for constituent lists)
CAF	=	Company accounts data request
CH	=	Chart request

# How to fill out the request table II

Datatype/Expressions/CAF Lookup	Start Date	End Date	Freq	Data Destination
  			Weekly	
P, DY	-1y		Weekly	Sheet1!\$A\$1

Which datatype(s) is/are requested?  
Eg.: P=price, DEFT=default.  
Press the magnifier to search for datatypes.  
Fx: Calculate expressions eg. Moving average  
CA: used for CAF requests

Start and end date for the request  
Hold the cursor over Start Date to see possible definitions

Where should the data be placed?  
If nothing is specified a new sheet will be made

# Search menu

Start: Select data category

Type in name of company e.g. Novo Nordisk

In addition on can use different critiria

The screenshot shows the Thomson Datastream Navigator search interface. A blue arrow points from the 'Data Category' dropdown menu to the 'Equities' option. Another blue arrow points from the 'Name' input field to the text 'Type in name of company e.g. Novo Nordisk'. The interface includes various search criteria sections:

- Data Category:** Equities (selected)
- Set Criteria:** Retrieve Results
- Name:** Input field
- DS Mnemonic:** Input field
- US Code:** Input field
- Market:** Input field
- Base Date (dd/mm/yy):** Input field
- Currency:** Input field
- Primary Quote:** ☒ All ☐ Yes ☐ No
- Major Security:** ☒ All ☐ Yes ☐ No
- Adjusted Prices:** ☒ All ☐ Yes ☐ No
- Status:** ☐ All ☒ Active ☐ Dead ☐ Suspended
- Instrument Type:**
  - ☐ American Depositary Receipt
  - ☐ Equity
  - ☐ Genussschein (Profit Participation Certificate)
  - ☐ Investment Trust
  - ☐ United States Warrant
  - ☐ Closed-End Fund
  - ☐ Exchange-Traded Fund
  - ☐ Global Depositary Receipt
  - ☐ Preference Share
- Exchange:** Input field
- Sector:** Input field
- SEDOL:** Contains [Input field]

On the right side, there are sections for 'Reset All Criteria', 'Search Operators', and a 'Thomson Datastream - Update' box.

**DataStream Navigator**

THOMSON DATASTREAM NAVIGATOR Series Search UCI UCTS Help Browse Interactive Charting

Data Category: **Equities**

[Set Criteria](#) [Retrieve Results](#) [Explorer](#)

Name	DS Mnemonic	DS Code	Market	Base Date	Currency	IBE
NOVO NORDISK 'B'	DK:NON	952033	Denmark	May 14 1974	Danish Krone	Yes
NOVO NORDISK 'B' (FRA)	D:NOVB	937002	Denmark	Sep 26 1988	Euro	No
NOVO NORDISK 'B' (FRA) ADR 1:1	D:NOVA	286431	Denmark	Feb 2 2005	Euro	No
NOVO NORDISK 'B' (LON)	NVOB	952988	Denmark	Sep 1 1980	Danish Krone	No
NOVO NORDISK 'B' (XET)	D:NOVX	693359	Denmark	Mar 26 1999	Euro	No
NOVO NORDISK 'B' ADR 1:1	U:NVO	997444	Denmark	Apr 30 1981	United States Dollar	Yes

Items 1-6 of 6

[Criteria](#) [Retrieve Results](#) [Res...](#)

Select Novo Nordisk 'B'

NAV BUILD:735 CLOSE HELP

[Use copied Explorer reference](#) [Extranet](#) [Back](#)

Displayed Results 75 Name contains novo nordisk

MSCI	WS	Primary Quote	Datatypes	Major Security
Yes	Yes	Yes	P-0574 MV-0574 DY-0574 PE-0574 RI-0574 PH-1091 <a href="#">more</a>	Yes
No	Yes	No	P-0988 MV-0988 DY-0988 PE-0988 RI-0988 PH-0888 <a href="#">more</a>	Yes
No	Yes	No	P-0205 MV-0205 DY-0205 PE-0205 RI-0205 PH-0205 <a href="#">more</a>	No
No	Yes	No	P-0980 MV-0980 DY-0980 PE-0980 RI-0980 UP-0980 <a href="#">more</a>	Yes
No	Yes	No	P-0399 MV-0399 DY-0399 PE-0399 RI-0399 PH-0399 <a href="#">more</a>	Yes
No	Yes	Yes	P-0481 MV-0481 DY-0481 PE-0481 RI-0481 PH-0781 <a href="#">more</a>	No

[Criteria](#) [Printable version](#)

Datatypes specifies which datatypes that are available for the specific instrument. For example price, EPS, dividend and market value.

A complet list can be found by pressing "more"

# Possible data types for a series

Possible datatypes for Novo Nordisk 'B'

Press the small book to get a description of the datatype

Notice that there can be more than one pages

**Thomson Datastream Navigator**

THOMSON DATASTREAM NAVIGATOR Series Search UCI UCTS Help Browse Interactive Charting NAV BUILD:735 CLOSE HELP

Series: NOVO NORDISK 'B' Mnemonic: DK:NON Display: All Datatypes Displayed Results 75 Back

Find Name Contains And Name Contains Filter / Search Reset

Name	Mnemonic	Start Date
Price (Adjusted - Default)	P	May 14 1974
Market Value (Capital)	MV	May 14 1974
Dividend Yield	DY	May 14 1974
Price/Earnings Ratio (Adjusted)	PE	May 14 1974
Total Return Index	RI	May 14 1974
Price - Intraday High	PH	Oct 7 1991
Price - Intraday Low	PL	Oct 7 1991
Price - Opening	PO	Aug 14 2000
Unadjusted Price	UP	May 14 1974
Price/Earnings Curr Year (IBES)	PE1	
Price/Earnings Next Year (IBES)	PE2	
EPS	EPS	May 14 1974
Turnover By Volume	VO	Oct 7 1991
EPS - Consensus Current Year Date (IBES)	EPS1D	
EPS - Consensus Next Year (IBES)	EPS2	
EPS - Consensus Next Year Date (IBES)	EPS2D	
EPS - Consensus Current Year (IBES)	EPS1	
Net Sales Or Revenues (Key Item)	WC01001	
Price - Bid	PB	Oct 7 1991
Price - Ask	PA	Oct 7 1991
Price (Adjusted - Default): Chi-X	P.CHX	Jan 10 2008
Price - Ask: Chi-X	PA.CHX	Jan 10 2008
Price - Bid: Chi-X	PB.CHX	Nov 1 2007

Items 1-75 of 106 Back Page: 1 2 Next

### Dividend yield – datatype (DY)

The dividend yield expresses the dividend per share as a percentage of the share price. The underlying dividend is calculated according to the same principles as datatype [DPSC](#) (Dividend per share, current rate) in that it is based on an anticipated annual dividend and excludes special or once-off dividends. For some countries the dividend used is a forecast.

Dividend yield is calculated on gross dividends (including tax credits) where available. Note that dividend yield for UK, Irish and French stocks is calculated on gross dividends (including tax credits), although dividends per share for these countries are displayed net.

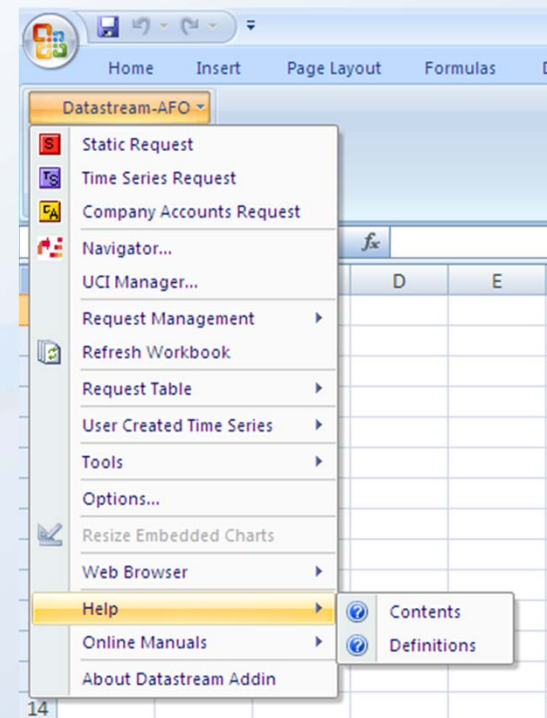
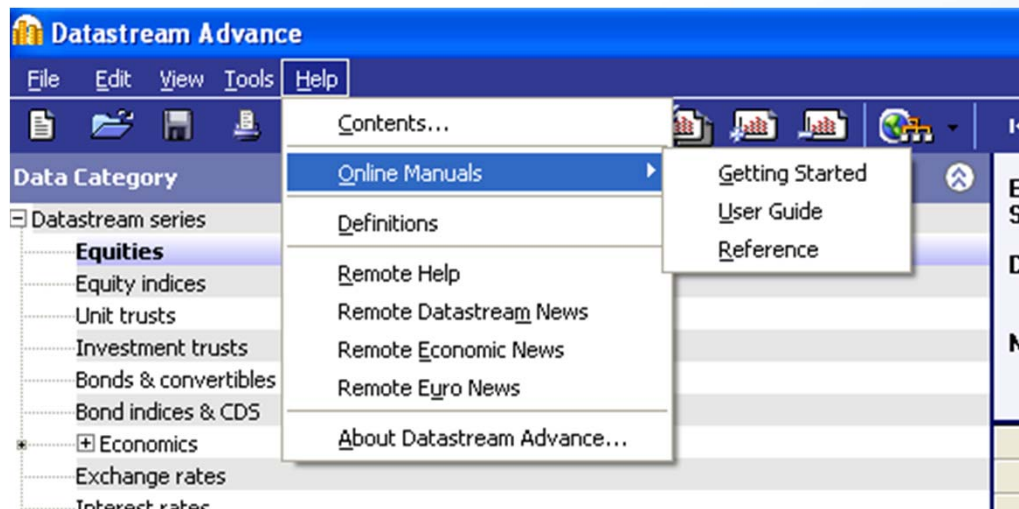
For Germany:

- for Datastream users in Germany, the dividend yield **includes** the tax credit applicable to domestic investors only
- for Datastream users outside Germany, the dividend yield **excludes** the tax credit applicable to domestic investors



# Help financial databases

- There is a very useful help feature in the program
- Introduction manuals for Zephyr and Datastream uploaded on [www.asb.dk/ag](http://www.asb.dk/ag)








# Event example - Datastream

- Fill out the request table (see example on next slide)
  - Use dates and ISIN codes from Zephyr
  - Remember that it is 200 trading days that you want, so go approximately 365 days back
  - Use Datatype=return index (RI)
- When data has been downloaded:
  - Make sure that event dates are in the same row and adjust to 200 days back (or the number of days you want) and 3 days in event window
  - Calculate log returns
  - Name the variables stock1, market1, stock2, market 2 etc.

# Event example - Datastream

- The Data stream table should look as the following:

Update	Request Type					Format	Series Lookup		Datatype/Expressions/CAF Lookup			Start Date	End Date	Freq	Data Destination
Yes/No	S	TS	TSL	CAF	CH	Select Format								Daily	
y		TS				R	DK0010244508		RI			10-06-04	10-07-05	Daily	Sheet1!R1C1
y		TS				R	DKKFXIN		DSRI			10-06-04	10-07-05	Daily	Sheet1!R1C3
y		TS				R	DK0010274414		RI			16-12-03	14-01-05	Daily	Sheet1!R1C5
y		TS				R	DKKFXIN		DSRI			16-12-03	14-01-05	Daily	Sheet1!R1C7
y		TS				R	DK0060079531		RI			22-06-07	21-07-08	Daily	Sheet1!R1C9
y		TS				R	DKKFXIN		DSRI			22-06-07	21-07-08	Daily	Sheet1!R1C11
y		TS				R	DK0010234467		RI			20-04-06	20-05-07	Daily	Sheet1!R1C13
y		TS				R	DKKFXIN		DSRI			20-04-06	20-05-07	Daily	Sheet1!R1C15
y		TS				R	DK0010234467		RI			13-03-05	12-04-06	Daily	Sheet1!R1C17
y		TS				R	DKKFXIN		DSRI			13-03-05	12-04-06	Daily	Sheet1!R1C19



# SAS

- First a basic introduction to SAS
- Brief introduction to each topic.
- Small assignments for each topic. Very limited time during the course – but solution is handed out so you can do them on your own.
- Self study: SAS matrix language – IML. Very useful for econometric studies, but requires knowledge of matrices.
- One can download it from our homepage ([www.asb.dk/aq](http://www.asb.dk/aq))

# SAS 9.1.3 user interface

- Three windows
  - Editor - F5
  - Output - F7
  - Log - F6
- Use CTRL + E to clear any of the windows
- F3 to submit your code
- Two Tabs
  - Results
  - Explorer

# Data library

- SAS library references = Highway to Data
- Preprogrammed library references:
  - SASUSER
  - Work (temporary)
- User defined library references:

```
libname name 'path';  
run;
```

# Libname examples

```
libname asb 'C:\documents\school\class';  
run;
```

```
libname mt 'M:\master thesis\datasets';  
run;
```

# Proc means

- Descriptive statistics can be computed about one or more variables by the proc mean.

```
proc means data=asb.brown;  
var sales1;  
run;
```



# Output

## The MEANS Procedure

Analysis Variable : SALES1

N	Mean	Std Dev	Minimum	Maximum
120	100.7250000	23.4459731	35.0000000	167.0000000

# Proc means

- You can get a 95% confidence interval by adding `cml mean` at the end of `proc means` statement.

```
proc means data=asb.brown cml mean;  
var sales1;  
run;
```

# Output

## The MEANS Procedure

Analysis Variable : SALES1

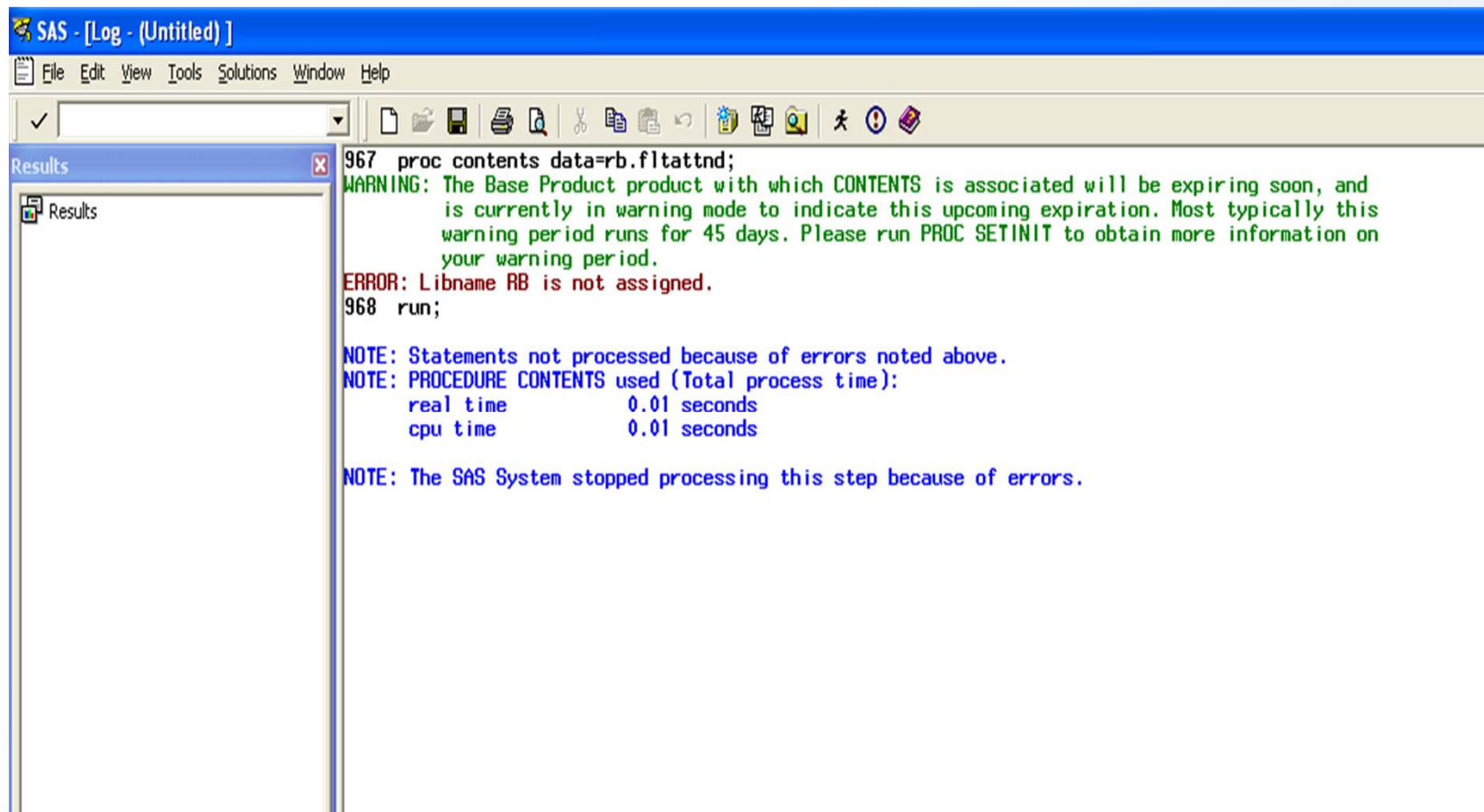
Lower 95% CL for Mean	Upper 95% CL for Mean	Mean
96.4869631	104.9630369	100.7250000



# Debugging techniques

- The SAS log is very useful when having problems running the code.
- You should ALWAYS check the log after submitting a code. Just because an output is generated, does not mean the code has been submitted without errors.
- Red = Bad
- Green = Warnings
- Blue = Good
- Examples...

# Libname not assigned...



The screenshot shows the SAS Log window for an untitled session. The log contains the following text:

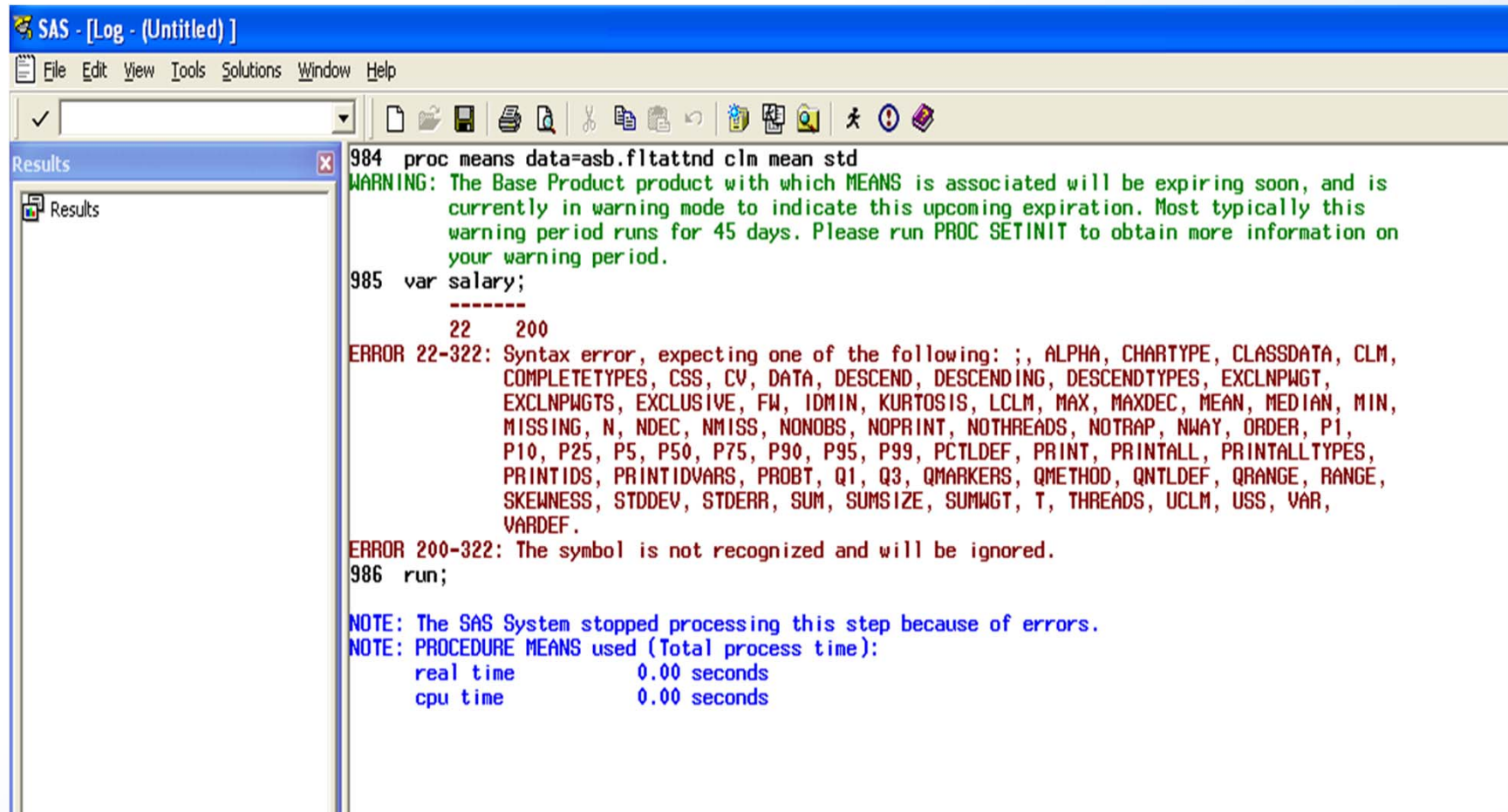
```
967 proc contents data=rb.fltattn;
WARNING: The Base Product product with which CONTENTS is associated will be expiring soon, and
is currently in warning mode to indicate this upcoming expiration. Most typically this
warning period runs for 45 days. Please run PROC SETINIT to obtain more information on
your warning period.
ERROR: Libname RB is not assigned.
968 run;

NOTE: Statements not processed because of errors noted above.
NOTE: PROCEDURE CONTENTS used (Total process time):
      real time          0.01 seconds
      cpu time           0.01 seconds

NOTE: The SAS System stopped processing this step because of errors.
```

The error message "ERROR: Libname RB is not assigned." is highlighted in red, indicating a critical issue that prevented the execution of the PROC CONTENTS step.

# Missing ; VERY COMMON MISTAKE



The screenshot shows the SAS Log window for an untitled session. The log contains the following text:

```
984 proc means data=asb.fltatnd clm mean std
WARNING: The Base Product product with which MEANS is associated will be expiring soon, and is
currently in warning mode to indicate this upcoming expiration. Most typically this
warning period runs for 45 days. Please run PROC SETINIT to obtain more information on
your warning period.
985 var salary;
-----
22      200
ERROR 22-322: Syntax error, expecting one of the following: ;, ALPHA, CHARTYPE, CLASSDATA, CLM,
COMPLETETYPES, CSS, CV, DATA, DESCEND, DESCENDING, DESCENDTYPES, EXCLNPWGT,
EXCLNPWGTs, EXCLUSIVE, FW, IDMIN, KURTOSIS, LCLM, MAX, MAXDEC, MEAN, MEDIAN, MIN,
MISSING, N, NDEC, NMISS, NONOBS, NOPRINT, NOTHREADS, NOTRAP, NWAY, ORDER, P1,
P10, P25, P5, P50, P75, P90, P95, P99, PCTLDEF, PRINT, PRINTALL, PRINTALLTYPES,
PRINTIDS, PRINTIDVARS, PROBT, Q1, Q3, QMARKERS, QMETHOD, QNTLDEF, QRANGE, RANGE,
SKEWNESS, STDDEV, STDERR, SUM, SUMSIZE, SUMWGT, T, THREADS, UCLM, USS, VAR,
VARDEF.
ERROR 200-322: The symbol is not recognized and will be ignored.
986 run;

NOTE: The SAS System stopped processing this step because of errors.
NOTE: PROCEDURE MEANS used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

The error message indicates a syntax error at line 985, where the variable 'salary' is listed without a semicolon at the end of the line. The error message lists various options that can follow the 'var' statement, but the semicolon is missing.

# Assignment 1

- Download the material from [www.asb.dk/ag](http://www.asb.dk/ag)
- Copy the material to the desktop and make and make a library that refers to the desktop
- Find the mean, std. deviation and confidence interval for the variable **Salary**, in the dataset '**fltattn**'.

# Proc Print

- Used to print an output
- Can control the following:
  - Which variables should be included
  - SUM some of the variables
  - Page the output according to a variable
  - Include/exclude variable according to condition(s)
  - ... and so on ...

# Proc Print examples

- Simple proc print:
- In general:

```
proc print data=asb.dataset;  
<sas statements> ...  
run;
```

- An example:

```
proc print data=asb.brown;  
run;
```

# Partial output...

Obs	SALES1	SALES2	SALES3	SALES4	SALES5	MONTH	YEAR
1	103	105	105	191	29	1	1948
2	106	106	112	158	37	2	1948
3	105	109	75	184	59	3	1948
4	95	96	116	97	71	4	1948
5	123	95	154	124	95	5	1948
6	111	105	136	92	123	6	1948
7	78	101	108	99	127	7	1948
8	96	112	90	113	130	8	1948
9	110	106	80	100	106	9	1948
10	68	115	72	150	90	10	1948
11	115	99	106	228	49	11	1948
12	96	110	100	199	42	12	1948
13	84	112	92	182	37	1	1949
14	73	100	112	175	31	2	1949
15	110	103	137	155	76	3	1949
16	116	101	144	149	85	4	1949
17	87	85	112	84	91	5	1949
18	94	83	94	36	91	6	1949
19	107	65	68	129	65	7	1949
20	99	47	86	107	49	8	1949
21	114	49	109	135	24	9	1949
22	49	49	103	203	14	10	1949

# Proc print examples

- If you only wish to include some of the variable in the output, you can use the var statement.

```
proc print data=asb.brown;  
var SALES1 MONTH YEAR;  
run;
```



# Partial Output...

Obs	SALES1	MONTH	YEAR
1	103	1	1948
2	106	2	1948
3	105	3	1948
4	95	4	1948
5	123	5	1948
6	111	6	1948
7	78	7	1948
8	96	8	1948
9	110	9	1948
10	68	10	1948
11	115	11	1948
12	96	12	1948
13	84	1	1949
14	73	2	1949
15	110	3	1949
16	116	4	1949
17	87	5	1949
18	94	6	1949
19	107	7	1949
20	99	8	1949
21	114	9	1949
22	49	10	1949

# Proc print examples

- You can use AND OR NOT to build up an expression.

```
proc print data=asb.brown;  
    var SALES1 YEAR MONTH;  
    where YEAR=1948 and MONTH=1;  
run;
```

```
proc print data=asb.brown;  
    var SALES1 YEAR MONTH;  
    where YEAR=1948 or MONTH=1;  
run;
```

# Outputs...

- where YEAR=**1948** and MONTH=**1**;

Obs	SALES1	YEAR	MONTH
1	103	1948	1

- where YEAR=**1948** or MONTH=**1**;

Obs	SALES1	YEAR	MONTH
1	103	1948	1
2	106	1948	2
3	105	1948	3
4	95	1948	4
5	123	1948	5
6	111	1948	6
7	78	1948	7
8	96	1948	8
9	110	1948	9
10	68	1948	10
11	115	1948	11
12	96	1948	12
13	84	1949	1
25	84	1950	1
37	94	1951	1
49	125	1952	1
61	66	1953	1
73	105	1954	1
85	79	1955	1
97	52	1956	1
109	112	1957	1

# Comparison Operators

Mnemonic	Symbol	Definition
EQ	=	Equal to
NE	$\neq$ or $\sim =$	Not equal to
GT	>	Greater than
LT	<	Less Than
GE	$\geq$	Greater than or equal to
LE	$\leq$	Less than or equal to
IN()		Equal to one of a list

# Partial output...

Obs	SALES1	YEAR	MONTH
1	103	1948	1
2	106	1948	2
3	105	1948	3
4	84	1949	1
5	73	1949	2
6	110	1949	3
7	84	1950	1
8	84	1950	2
9	109	1950	3
10	94	1951	1
11	78	1951	2
12	114	1951	3
13	125	1952	1
14	118	1952	2
15	115	1953	1
16	66	1953	2
17	66	1953	3
18	98	1953	4
19	105	1954	1
20	112	1954	2
21	127	1954	3
22	79	1955	1
23	42	1955	2
24	59	1955	3
25	44	1955	4
26	48	1956	1
27	112	1957	1
28	133	1957	2
29	117	1957	3
=====			
	2868		

# Assignment 2

- Open the data set **weekrev** (same path as assignment 1) to see the variables.
- Make a print of the dataset where only the variables **FlightID Origin Date CargoRev** and **PasRev** are included.

# Proc Sort

- Use the proc sort statement in order to sort the dataset by a variable.
- The general proc sort statement:

```
Proc sort data=input dataset  
<out=output dataset>;  
by <descending> by-variable(s);  
run;
```

- Output dataset is optional – if nothing wrote, the original dataset will be renewed.
- Ascending by default – write descending if you want that.



# Proc sort examples

```
proc sort data=asb.brown;  
by YEAR;  
run;
```





# Output...

SALES4	SALES5	MONTH	YEAR
191	29	1	1948
158	37	2	1948
184	59	3	1948
97	71	4	1948
124	95	5	1948
92	123	6	1948
99	127	7	1948
113	130	8	1948
100	106	9	1948
150	90	10	1948
228	49	11	1948
199	42	12	1948
182	37	1	1949
175	31	2	1949
155	76	3	1949
149	85	4	1949
84	91	5	1949
36	91	6	1949

# Data steps

- SAS data steps are used when working with variables, making calculations, creating new variables, creating new data sets etc.

```
Data libname.dataset;  
set libname.dataset;  
additional sas statements;  
run;
```

# Data steps examples

- How to create a new dataset using an old

```
data asb.new_brown;  
set asb.brown;  
Keep SALES1 SALES2;  
run;
```

In stead of keep, the function drop could be used.

# Partial Output...

Obs	SALES1	SALES2
1	68	115
2	78	101
3	95	96
4	96	112
5	96	110
6	103	105
7	105	109
8	106	106
9	110	106
10	111	105
11	115	99
12	123	95
13	49	49
14	73	100
15	75	64
16	84	112
17	87	85
18	94	83
19	99	47

# Data steps examples

- How to create new variables by calculations:

```
data asb.new_brown;  
set asb.brown;  
Total = SALES1 + SALES2;  
keep SALES1 SALES2 Total;  
run;
```

# Partial Output

Obs	SALES1	SALES2	Total
1	68	115	183
2	78	101	179
3	95	96	191
4	96	112	208
5	96	110	206
6	103	105	208
7	105	109	214
8	106	106	212
9	110	106	216
10	111	105	216
11	115	99	214
12	123	95	218
13	49	49	98
14	73	100	173
15	75	64	139
16	84	112	196
17	87	85	172
18	94	83	177

# Assignment 3

- Make a new data set called **total\_rev** in the work library on the basis of the data set **sales121999**. Make a variable called **total**, which adds the four revenue variables (**FClassRev** **BClassRev** **EClassRev** and **CargoRev**)
- The new data set should only contain The variables **FlightID** **RouteID** and the new variable **total**.
- Make a **print** of the new data set.

# IF statements

- IF statements are very similar to the ones in e.g. Excel. However it is possible to use if statements to manipulate with the output data in SAS. IF statements are used within a data step.

```
data out_dataset;  
set input_dataset;  
if expression then do;  
executable statements;  
end;  
else do / else if;  
executable statements;  
end;
```



# IF statements example

- If we only want information on the flights to seattle.

```
data seattle; ←  
set asb.passngrs;  
if Dest='SEA' then output;  
keep FlightID Dest;  
run;
```

Goes to work.  
Temporary  
folder...

Notice the ''  
surrounding  
SEA. These are  
necessary  
because its  
characters.

# Output

Obs	Flight ID	Dest
1	IA01802	SEA
2	IA01804	SEA
3	IA01802	SEA
4	IA01804	SEA
5	IA01802	SEA
6	IA01804	SEA
7	IA01802	SEA
8	IA01804	SEA
9	IA01802	SEA
10	IA01804	SEA
11	IA01802	SEA
12	IA01804	SEA
13	IA01802	SEA
14	IA01804	SEA

# IF statement examples

- Deleting cases:
  - Eg. we dont want flights with less than 13 First Class passengers.

```
data new_passngrs;  
set asb.passngrs;  
if FClass lt 13 then delete;  
run;
```

# Output

Obs	Flight ID	Dest	Depart	FClass	BClass	EClass
1	IA02901	HNL	15101	13	24	138
2	IA03100	ANC	15101	13	22	150
3	IA03101	ANC	15101	14	.	133
4	IA02901	HNL	15102	14	25	132
5	IA03100	ANC	15102	16	26	143
6	IA03100	ANC	15103	14	18	137
7	IA02901	HNL	15104	13	22	150
8	IA03100	ANC	15104	14	17	144
9	IA03101	ANC	15104	13	.	142
10	IA02901	HNL	15105	13	14	145
11	IA03100	ANC	15105	15	22	99
12	IA02901	HNL	15106	13	24	137
13	IA03100	ANC	15106	15	16	137
14	IA02901	HNL	15107	13	19	144
15	IA03100	ANC	15107	15	23	105

# If conditions

If conditions can be very useful in order to control output and calculations under given conditions.

The flight company takes \$1000 for a trip to HNL,  
\$1500 for a trip to SEA and \$2000 for a trip to ANC.

In order to calculate the turnover, we need to make a if-then-do condition.

# IF-then-do

```
data FClass_calc;  
set asb.passngrs;  
    if Dest='HNL' then do;  
        Turnover=1000;  
    end;  
    else if Dest='SEA' then do;  
        Turnover=1500;  
    end;  
    else if Dest='ANC' then do;  
        Turnover=2000;  
    end;  
run;
```

# Output...

Obs	Flight ID	Dest	Turnover
1	IA01802	SEA	1500
2	IA01804	SEA	1500
3	IA02901	HNL	1000
4	IA03100	ANC	2000
5	IA03101	ANC	2000
6	IA01802	SEA	1500
7	IA01804	SEA	1500
8	IA02901	HNL	1000
9	IA03100	ANC	2000
10	IA01802	SEA	1500
11	IA01804	SEA	1500
12	IA02901	HNL	1000
13	IA03100	ANC	2000
14	IA01802	SEA	1500
15	IA01804	SEA	1500
16	IA02901	HNL	1000
17	IA03100	ANC	2000
18	IA03101	ANC	2000
19	IA01802	SEA	1500
20	IA01804	SEA	1500
21	IA02901	HNL	1000
22	IA03100	ANC	2000
23	IA01802	SEA	1500
24	IA01804	SEA	1500
25	IA02901	HNL	1000
26	IA03100	ANC	2000
27	IA01802	SEA	1500
28	IA01804	SEA	1500
29	IA02901	HNL	1000
30	IA03100	ANC	2000

# Assignment 4

- On the basis of the data set **pilots** create a new data set called **new\_pilots**
- The data set must contain all pilots who has the job code PT2 and earn more than 84000 \$
- Make a print of new\_pilots that includes the variables IDNum and Salary.



# Iterative data processing

- It is possible to get SAS to do calculations iteratively by using loops.
- These calculations can for example be useful when making investment calculations.

# Do loop

```
data <dataset name>;  
    do i= 1 to 5;  
        statement1;  
        statement2;  
    end; ←  
run;
```

When SAS reaches this point, it will loop as long as it is less than (or equal to) 5

# Do loop example...

Each year we deposit 50,000 dollars at an interest rate on 7,5%. If we start in 2000, how much do we have in 2005?

```
data invest;  
    do Year=2000 to 2004;  
        Capital + 50000;  
        Capital + (Capital*0.075);  
    end; ←  
run;
```

Loops if Year  
is between  
2000 and  
2004

# Importing data fra .csv .txt .xls

- Importing via wizard (File=> Import Data..)
- Importing via programming

# Importing from Excel

- Importing from Excel leaves you with several options:
- Replace – will overwrite existing dataset
- Sheet='sheetname' You can define the sheet(s) that you need to import.
- Getnames=yes/no You can use the first cell in each column as the variable name
- Mixed=yes/no – specifies whether there are both character and numeric observations within certain variables.
- Usedate = yes/no – are there any dates in the worksheet?

# Importing from Excel

```
proc import out=work.stocks  
datafile='C:\Documents and  
Settings\rix\Desktop\stock.xls' replace;  
sheet='sheet1';  
Getnames=yes;  
Mixed=no;  
usedate=yes;  
run;
```

# Regression analysis

- OLS estimation using SAS.
- Can be done using proc reg
  - Good when performing traditional regression analysis where assumptions needs to be evaluated.
  - Best when estimating few models – models must be estimated one by one.
- Another alternative is using matrix algebra
  - Good when estimating many models – for example estimating company betas for 1000 companies. You have already worked shortly with this during AEM 1.
  - Is not a required part of this course. However slides for the IML course are available from our homepage [www.asb.dk/ag](http://www.asb.dk/ag)

# Proc reg

- The proc reg procedure in its most simple form looks like this:

```
proc reg data=fib.sales;  
model y=x1 x2;  
run;
```



# Output

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2935.10281	1467.55141	29.10	<.0001
Error	27	1361.86385	50.43940		
Corrected Total	29	4296.96667			
Root MSE		7.10207	R-Square		0.6831
Dependent Mean		64.63333	Adj R-Sq		0.6596
Coeff Var		10.98825			
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	15.32762	7.16023	2.14	0.0415
X1	1	0.78034	0.11939	6.54	<.0001
X2	1	-0.05016	0.12992	-0.39	0.7025

# Proc reg

- After the model is specified there are several options that may help you analyze your model further.
- NOINT = No intercept in the model.
- DW = Durbin Watson test
- P = Predicted value plus residual of the Y's.
- CLM = 95% confidence interval for the expected value of the dependent variable (mean) for each observation.
- Etc. for further options see:  
[http://www.ats.ucla.edu/stat/sas/library/SASReg\\_mf.htm](http://www.ats.ucla.edu/stat/sas/library/SASReg_mf.htm)

# Proc reg

- The options are used after the model specification

```
proc reg data=fib.sales;  
model y=x1 x2 / noint p ;  
run;
```

- Will ignore intercept in the model and output the predicted values.

# Output

Output Statistics			
Obs	Dependent Variable	Predicted Value	Residual
1	43.0000	48.6223	-5.6223
2	63.0000	61.6244	1.3756
3	71.0000	67.9582	3.0418
4	61.0000	60.4245	0.5755
5	81.0000	74.8243	6.1757
6	43.0000	53.1940	-10.1940
7	58.0000	63.9943	-5.9943
8	71.0000	71.7713	-0.7713
9	72.0000	79.2594	-7.2594
10	67.0000	58.5714	8.4286

# Assignment 5

Make the following regression model using proc reg:  
(the dataset is called b\_fitness)

$$\text{Oxygen\_consumption} = \beta_0 + \beta_1 * \text{Performance} + \beta_2 * \text{Runtime} + \beta_3 * \text{Age} + \beta_4 * \text{Weight}$$

# Where to learn more?

- Borrow *SAS books at the libaray*
- F1 – very useful. Place the cursor on a statement, frase or anything in your code, and press F1.
- Try to Google your question...
- Ask for help at [analyse@asb.dk](mailto:analyse@asb.dk)

# Event study in SAS

1. Import data
2. Estimate market model based on the estimation period
3. Calculate abnormal returns
4. Calculate test statistic (see next couple of slides)

# Test Procedure for T<sup>1</sup>

- Estimate the market model for each of the “N” stocks over the estimation period with T observations.
- Calculate the excess or abnormal return for each stock over the estimation period (=residuals from the regression) and event period (= forecast errors):

$$A_{jt} = r_{jt} - \alpha_j - \beta_j r_{mt}$$

- Calculate the average excess return for each period (both estimation and event period).

$$\bar{A}_t = \frac{1}{N_t} \sum_{j=1}^{N_t} A_{jt}, \forall t = 1, ..T + n$$



# Procedure for $T^1$

- Calculate the standard deviation of the *average* excess return over the estimation period (T observations):

$$S(\bar{A}) = \sqrt{\frac{1}{T} \sum_{t=1}^T (\bar{A}_t - \bar{\bar{A}})^2}$$

Zero when using the market model

- where:

$$\bar{A}_t = \frac{1}{N_t} \sum_{j=1}^{N_t} A_{jt}$$

$$\bar{\bar{A}} = \frac{1}{T} \sum_{t=1}^T \bar{A}_t$$

- For each date in the event window (here three days) calculate the test statistic

$$T_t^1 = \frac{\bar{A}_t}{S(\bar{A})} \square t(T-1), t = -1, 0, +1$$


# Cumulative average residuals.

- Event day uncertainty
  - ✎ Long window – dilute the effect
  - ✎ Short window – miss the effect
- The cumulative average residuals over an event window of three days is given by:

$$CAR = \bar{A}_{-1} + \bar{A}_0 + \bar{A}_{+1}$$

- To test for significance of the CAR's over the entire event window the following test statistic is used:

$$T_1^{CAR} = \frac{\sum_{t=-1}^1 \bar{A}_t}{\sqrt{3S(\bar{A})^2}}$$

$$S(\bar{A}) = \sqrt{\frac{1}{T} \sum_{t=1}^T (\bar{A}_t - \bar{\bar{A}})^2}$$


- Returns are independent => we can sum the variances

# Event study – sum up

## 1. Zephyr

- Select events
- Remember to include ISIN

## 2. Datastream

- Build up Request table
- Return index for stocks and market for the different periods

## 3. Excel

- Adjust data to estimation and event period
- Calculate log returns
- Name variables (stock1,market1 etc.)

## 4. SAS

- Adjust SAS code
- Run code
- Add additional test statistics



# Evaluation

Please evaluate the course:

Thank you for participating