Statistical Software and Freeware for Data Analysis in Management

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Format of Presentation

- **Overview of packages and features**
- **Examples for undergrad, MBA and PhD classes**
  - **Research statistics are superset of these analysis techniques**
- **Licensing/administrative issues**
- **Discussion**

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1. Comparing the Packages

- **Evaluation criteria**
- **List of packages**
- **Statistical tools provided**

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Evaluation Criteria

- **Statistical analysis capabilities**
- **Supported computer configurations**
- **Graphics capabilities and user friendliness**
- **Extensibility/programmability**
- **Prior experience (switching cost)**
- **Cost**

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Basic Analysis Tools

- **Descriptives**
- **Correlation**
- **Chi-square hypothesis testing**
- **1-D, 2-D data plotting**

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Regression

- **Regression, multiple regression**
- **ANOVA/MANOVA**
- **Time series (ARIMA, ARCH)**
- **Survival analysis (hazard models)**
- **Logit/probit**
- **GLM**

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Other Analysis Techniques

- **Cluster**
- **Conjoint**
- **Factor analysis: ML, principal component**
- **Structural equation models**

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Related Capabilities

- **Bootstrap/jackknife estimation**
- **Wald, likelihood ratio tests**
- **Monte carlo simulation**
- **Matrix mathematics**

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Commercial Packages

- **JMP***
- **Minitab**
- **SAS**
- **SPSS***
- **Stata***
- **Statistica**
- **WINKS***

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Freeware Packages

- **ADE-4 (U. Lyon)**
- **Lisp-Stat (U. Minnesota/UCLA)**
  - **ViSta (UNC)***
  - **WinAnova/MacAnova (U. Minnesota)**
- **R (U. Auckland/CMU)***

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Supported Configurations

CPU:	Intel			PowerPC		Other	
OS:	95/98	2000	Linux	MacOS	Linux	Unix	M.F.
JMP	•	•		•			
Minitab	•	•		†			
SAS	•	•	*	†		•	•
SPSS	•	•		*			
Stata	•	•	•	•	•	•	
Statistica	•	•		†			
WINKS	•	•					
ADE-4	•	•		•			
Lisp-Stat	•	•		•		•	
R	•	•	•		•	•	
Vista	•	•	•	•		•	
WinAnova	•	•		•		•	

* due later this year † discontinued, but still available

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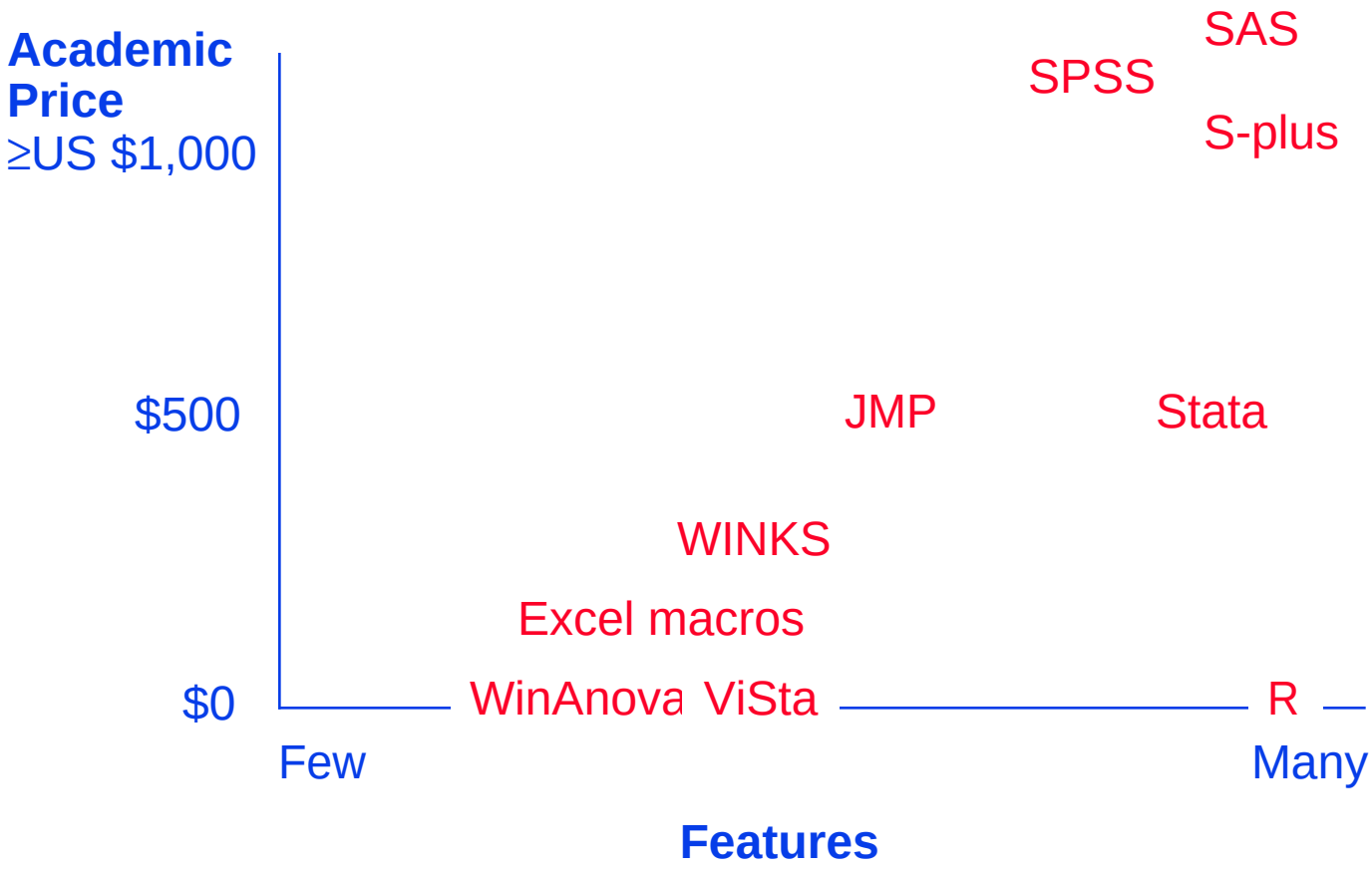
Price vs. Features



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Statistical Capabilities

	JMP	SPSS	Stata	WINKS	R	ViSta
Basic Analysis Tools						
Descriptives	•	•	•	•	•	•
Correlation	•	•	•	•	•	
1-D, 2-D data plotting	•	•	•	Basic,Pro	•	•
Regression						
Regression, multiple regression	•	•	•	•	•	•
ANOVA/MANOVA	•	•	•	•	•	•
Time series (ARIMA, ARCH)	•	Trends	•	Pro	arima	
Survival analysis (hazard models)	•	Advanced	•	Basic,Pro	survival5	
Logit/probit	•	Regression	•		•	
GLM			•		•	
Other Analysis Techniques						
Cluster	•	•			multiv	
Conjoint		Conjoint				
Multi-dimensional scaling		Categories			cmdscale	•
Principal components	•	Categories	•		multiv	•
ML factor analysis		•	•			
Structural equation models		Amos			pls	
Related Capabilities						
Bootstrap/jackknife		Regression	•		boot	
Wald, LR tests	•	Exact	•			
Monte carlo simulation		Exact	•		mcmc	
Matrix mathematics	•	•	•		•	

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Other Features

- **Graphical design**
  - » **Charting/graphing capabilities**
  - » **Graphical user interface (GUI)**
- **Ease of use**
- **Extensibility**
  - » **Optional modules**
  - » **Programmability**

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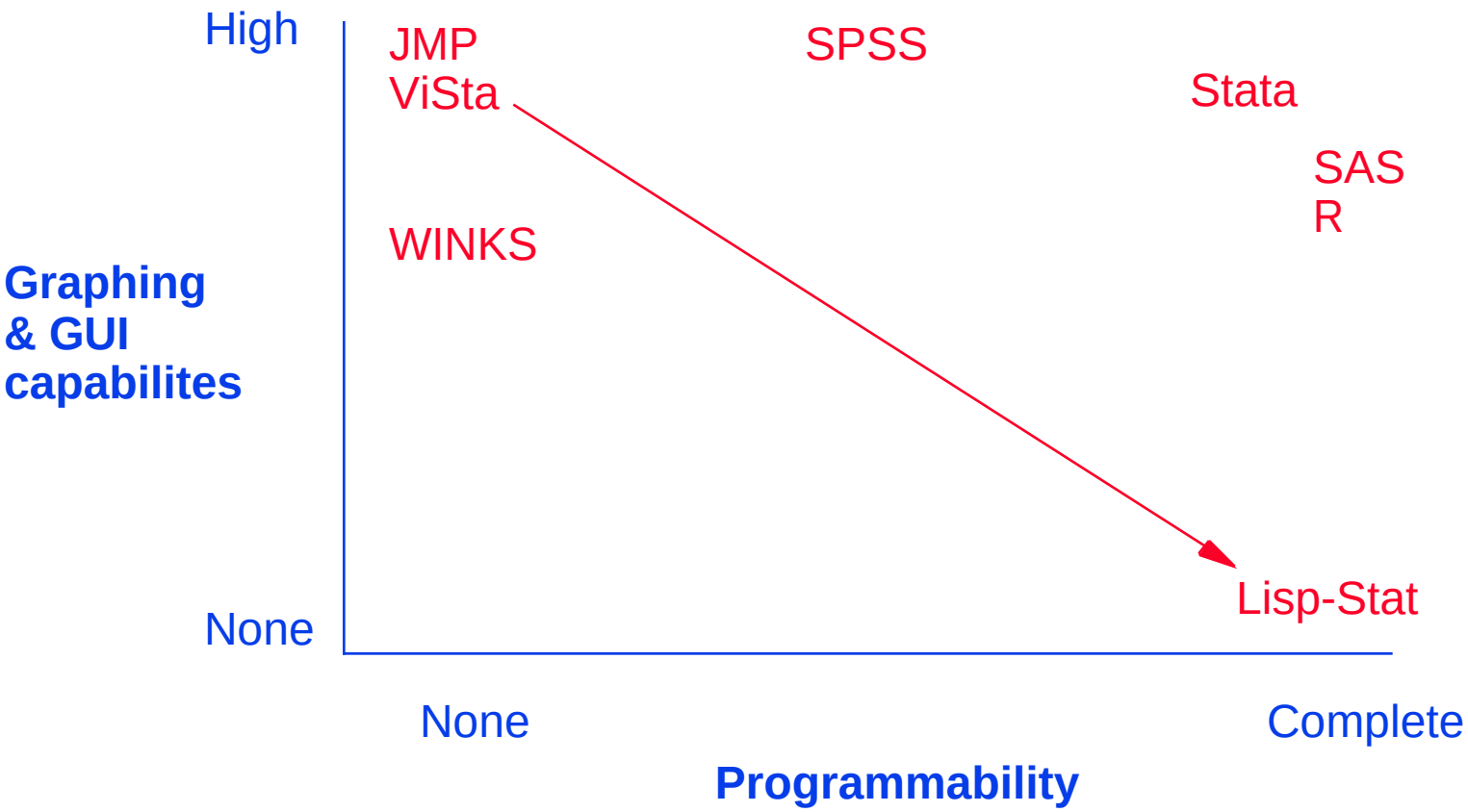
Graphics/Programming Capabilities



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2. Teaching Undergrad Stats

- **Typical syllabus**
- **Introduce the packages**
- **Demonstrations**

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Upper-Division Syllabus

- **Vectors and matrix concepts**
- **Descriptive statistics**
  - **Mean, standard deviation**
  - **Variation, sum of squares**
- **Correlation**
  - **Scatter plots**
- **Least squares regression**
  - **Linear**
  - **Simple non-linear forms (quadratic, cubic, exponential, logarithmic)**

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Demonstration

- **Packages:**
  - **JMP**
  - **WINKS**
- **Test problems:**
  - **Cross-tabs**
  - **Correlations**
  - **Visualization**

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3. Teaching MBA Stats

- **Typical syllabus**
- **Introduce the packages**
- **Demonstrations**

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MBA Syllabus

- **Probability concepts**
- **Hypothesis testing**
- **Correlation**
- **Linear regression**
- **ANOVA**

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Demonstration

- **Packages:**
  - **SPSS**
  - **ViSta**
- **Test problems:**
  - **Regression**
  - **ANOVA**

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4. PhD Statistics and Research

- **Typical syllabus**
- **Introduce the packages**
- **Demonstrations**

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PhD Syllabus

- **Association:**
  - » **Principal components**
  - » **Factor analysis**
  - » **Cluster analysis**
- **MANOVA**
- **Multiple regression: OLS, GLS, ML**
- **Categorical variables:**
  - » **Discriminant analysis**
  - » **Logit/Probit models**

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Demonstration

- **Packages:**
  - **Stata**
  - **R**
- **Test problem:**
  - **Logit**

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5. Licensing/Administrative Issues

- **Configurations**
- **Pricing**
- **Combined texts/software**

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Student Versions

- **JMP**
  - » **JMP IN Book/software ($63): almost completely featured**
- **SPSS**
  - » **†Student Version ($60): limited features and datasets**
  - » **Book/software ($70-$90?): usable for 13 months only**
  - » **†Career starter ($85): all "base" module features**
  - » **†Grad pack ($175): full features, with popular modules**
- **Stata**
  - » **StataQuest book/software ($35), limited functionality**
  - » **†Small Stata ($55): full features but limited datasets**
  - » **†Grad Plan ($100): full features**

† Limited printed documentation

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Computer Lab Site Licenses

- **JMP**
  - » **Annual license**
  - » **$160/seat plus $80/seat/year after year 1 (min. 10 seats)**
- **SPSS**
  - » **Annual or perpetual licenses**
  - » **“There are many variables to site license pricing”**
- **Stata**
  - » **Perpetual license**
  - » **$70/seat ($85 for UNIX) plus $125 one-time fee (min. 10 seats)**

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Full Academic Licenses

- **JMP**
  - » **Perpetual license: $395**
- **SPSS**
  - » **“Base” license: $450**
  - » **Additional modules: $250-$450 each**
- **Stata**
  - » **Perpetual license: $445**

Prices are less with site licenses

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For More Information

Robert Stine & John Fox, eds., *Statistical Computing Environments for Social Research*, Sage, 1996.

- **APL2**
- **Gauss**
- **Lisp-Stat**
- **Mathematica**
- **SAS**
- **Stata**
- **S-Plus (and thus R)**
- **ViSta**

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6. Discussion

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Commercial SEM Packages

The most popular SEM packages are:

- **AMOS**
- **EQS**
- **LISREL**

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Free SEM Packages

Most of the free packages are implementations of Wold's PLS algorithm, which has very different estimation properties. These packages include:

- **LV-PLS (MS-DOS program)**
- **PLS.SAS and PROC PLS (requires SAS)**
- **pls (requires R)**

See also Mx (free) and PLS Graph (beta)

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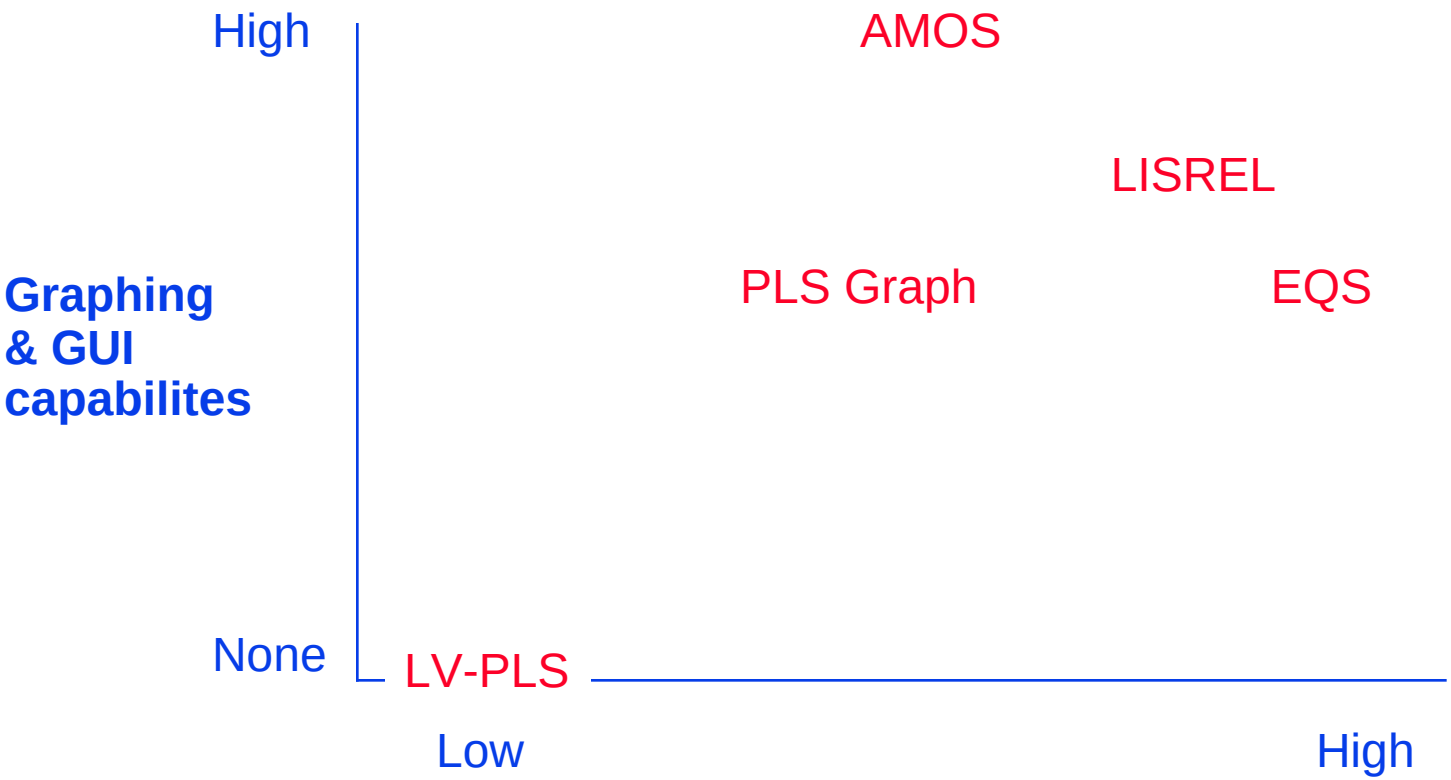
Graphics vs. Statistics



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Key Issues

- **Statistical analysis capabilities:**
  - » **Dynamically changing methodology**
  - » **Thus, important to keep up to date with developments**
  - » **Major issues (differences between packages):**
    - » **Robust estimation methods**
    - » **Measures of goodness of fit**
- **Graphics & GUI**
- **Price**

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