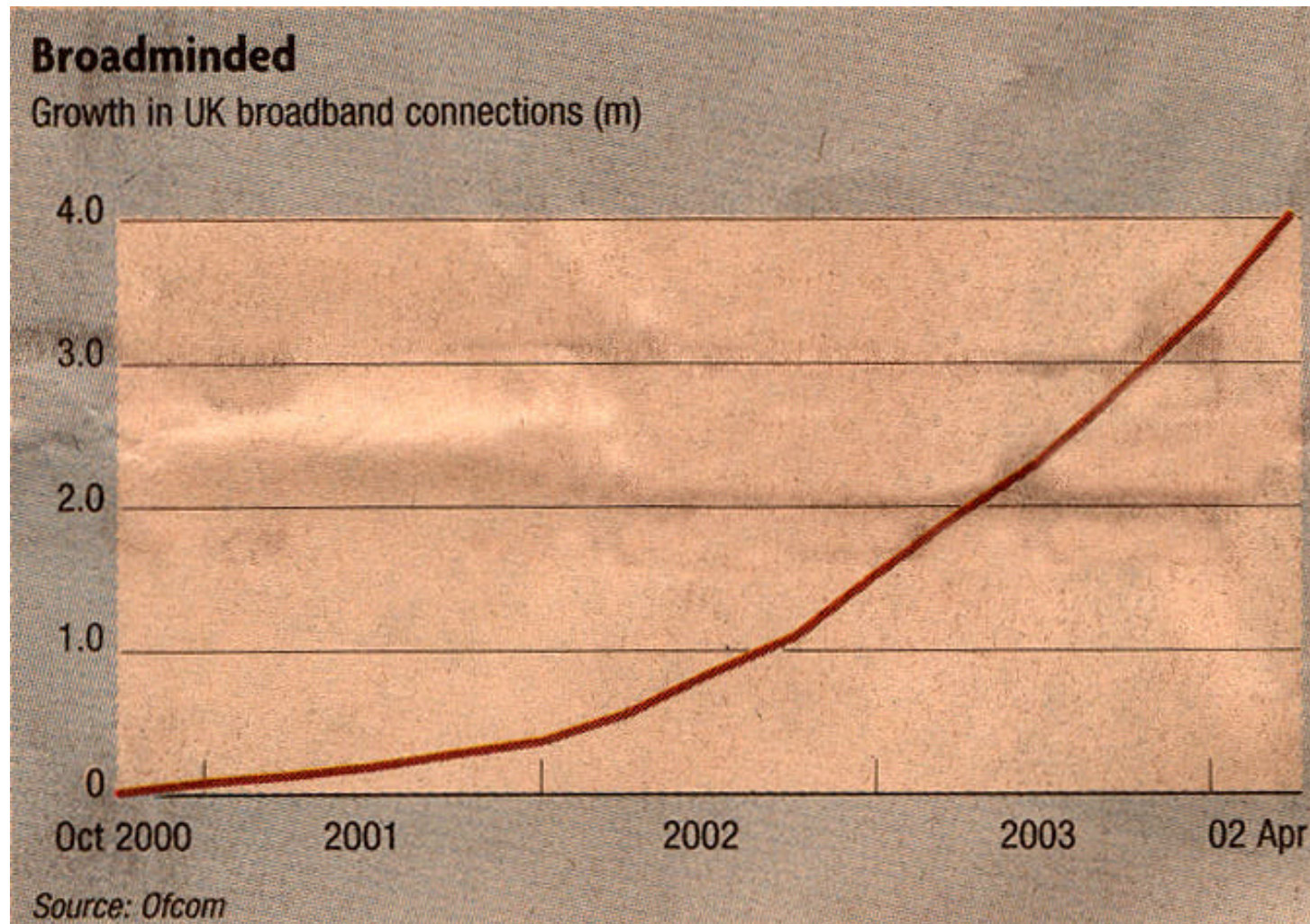


**Applications of Diffusion Models in
Telecommunications
Nigel Meade**

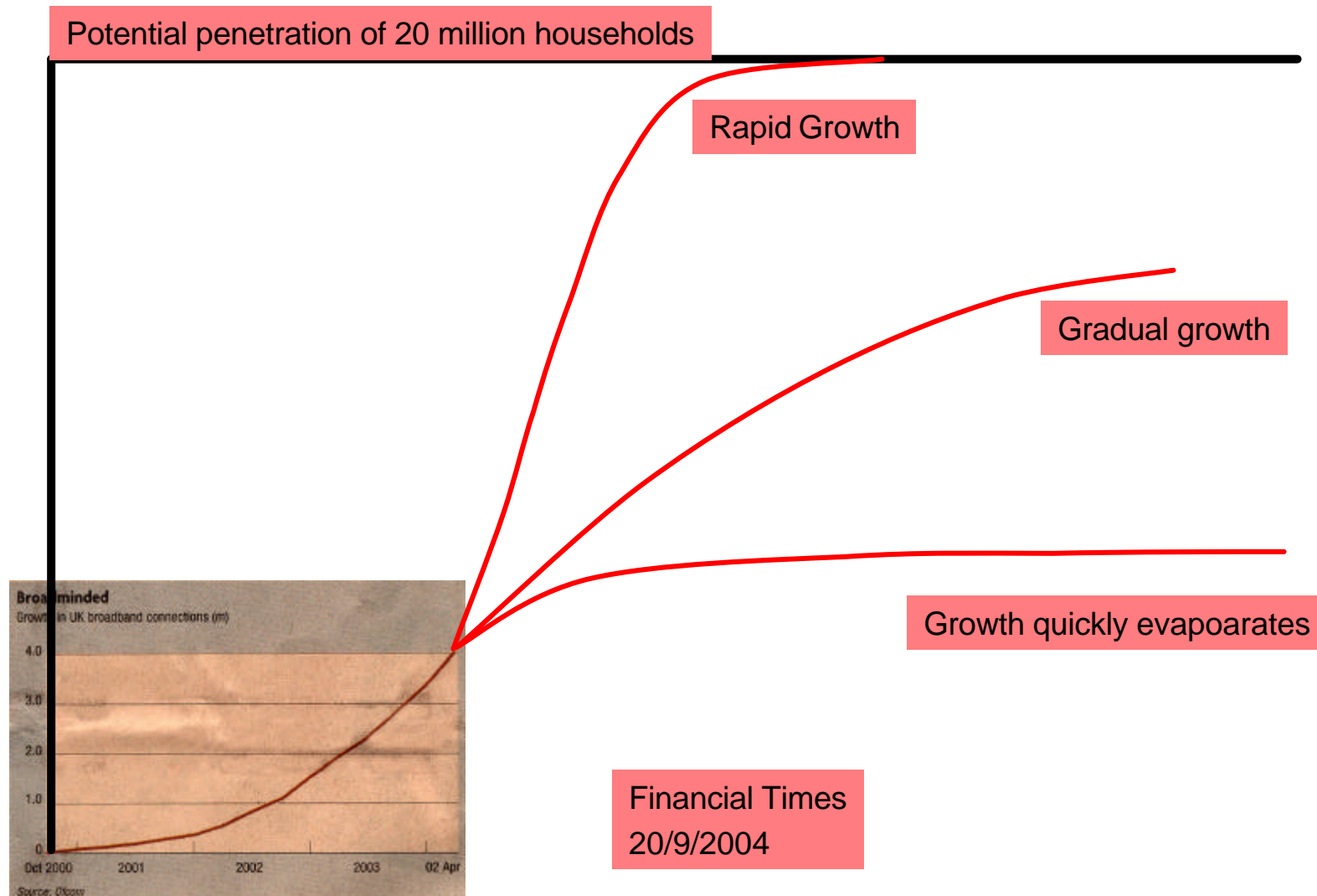
Introduction

- Recent examples of diffusion in telecomms
- Definition of diffusion model
- Survey of telecomms applications
 - Extrapolation
 - Use of explanatory variables
- Inter-market models
 - Multi - national
 - Multi - generation
 - Multi - technology
- Strengths
- Weaknesses

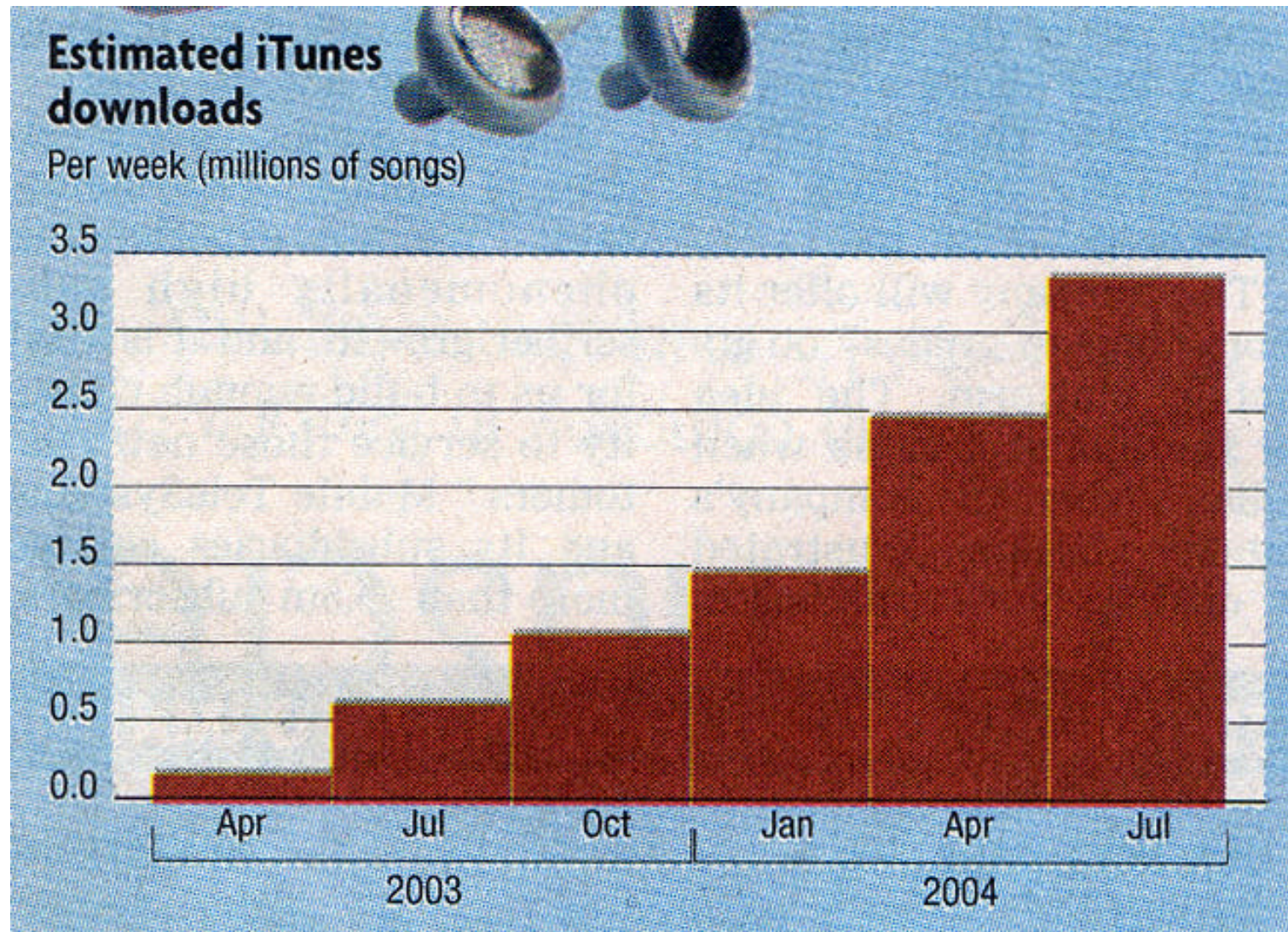
Recent examples of diffusion in telecomms - 1



Recent examples of diffusion in telecomms – 1a

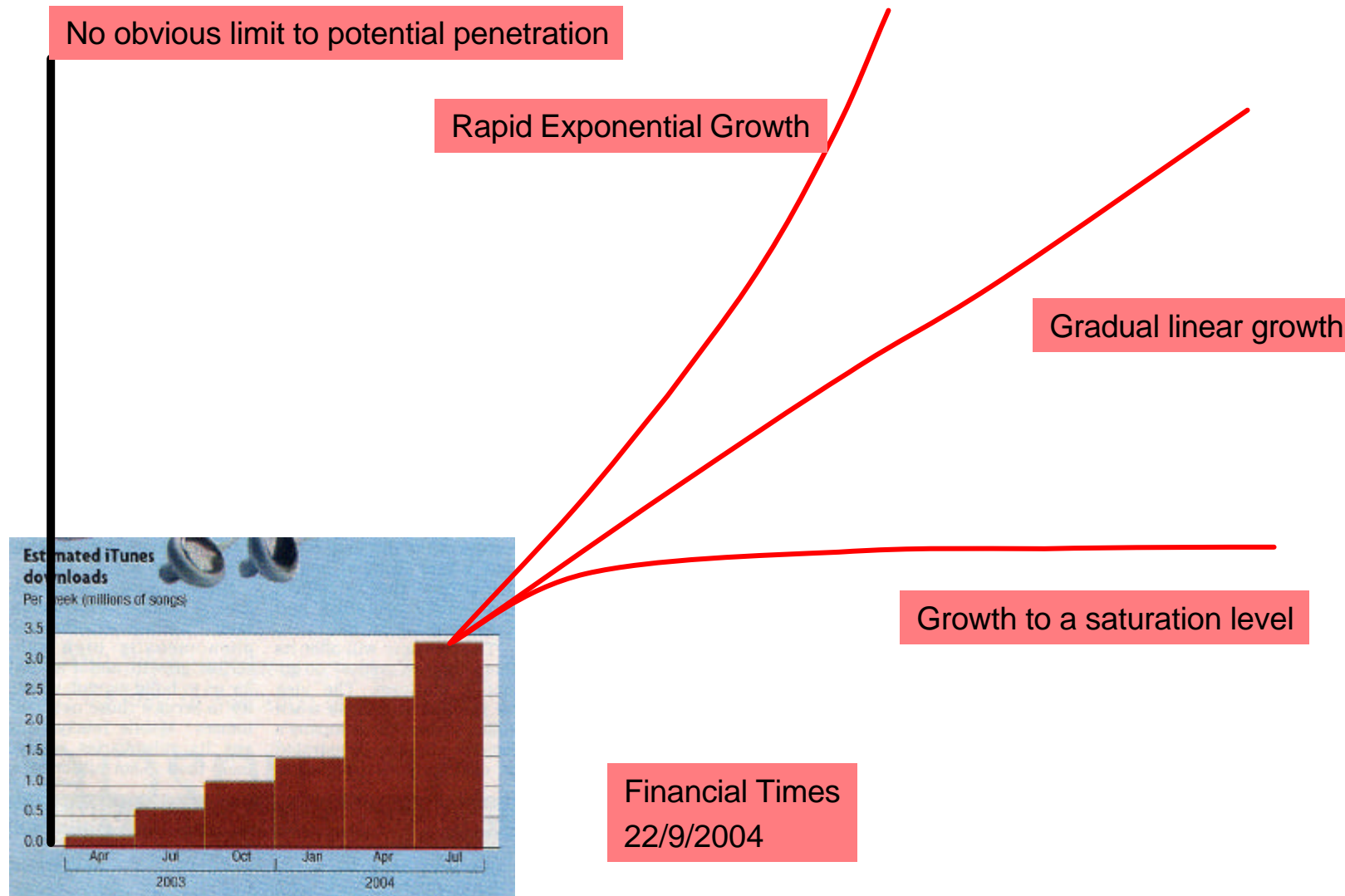


Recent examples of diffusion in telecomms - 2

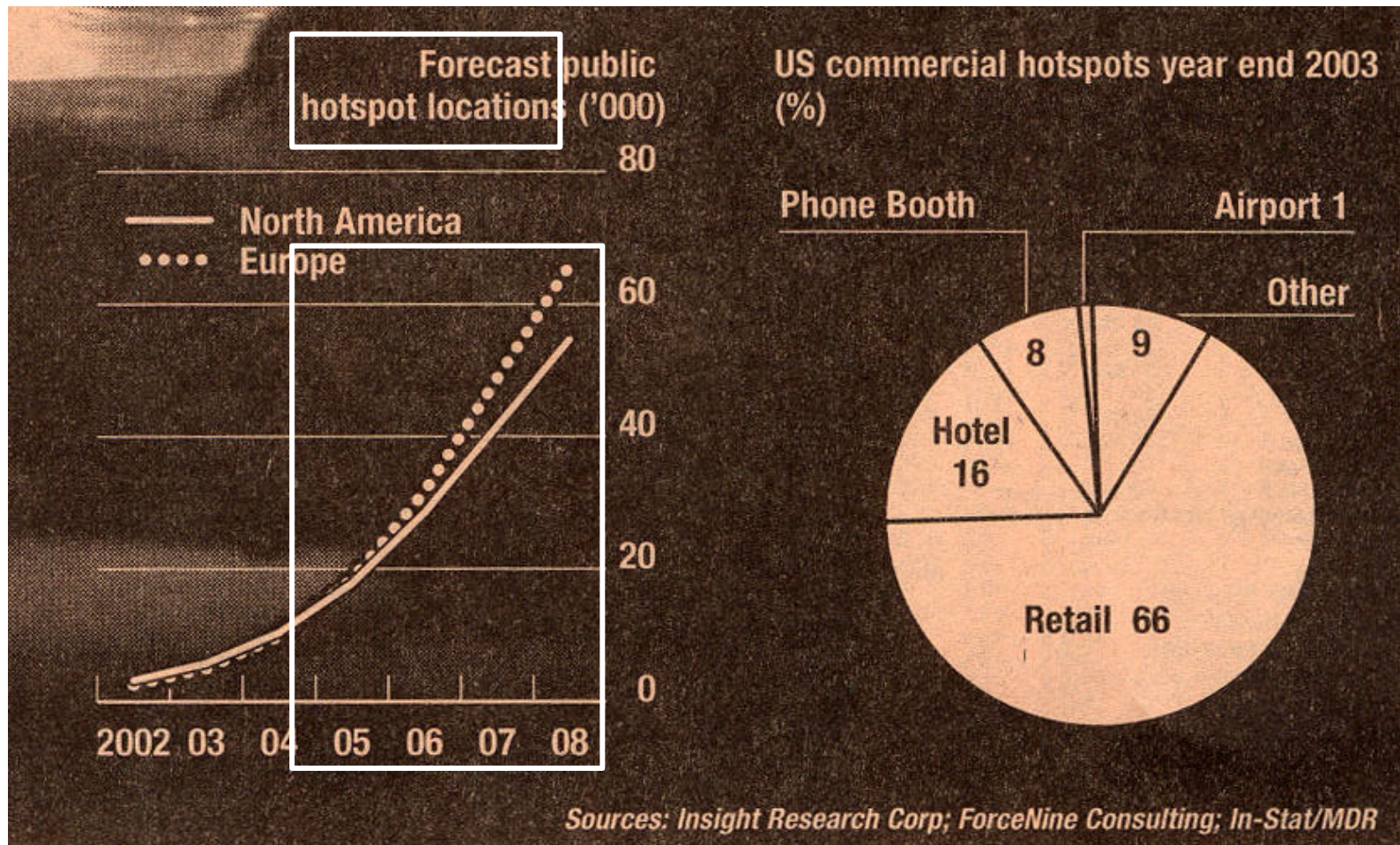


Financial Times
22/9/2004

Recent examples of diffusion in telecomms – 2a

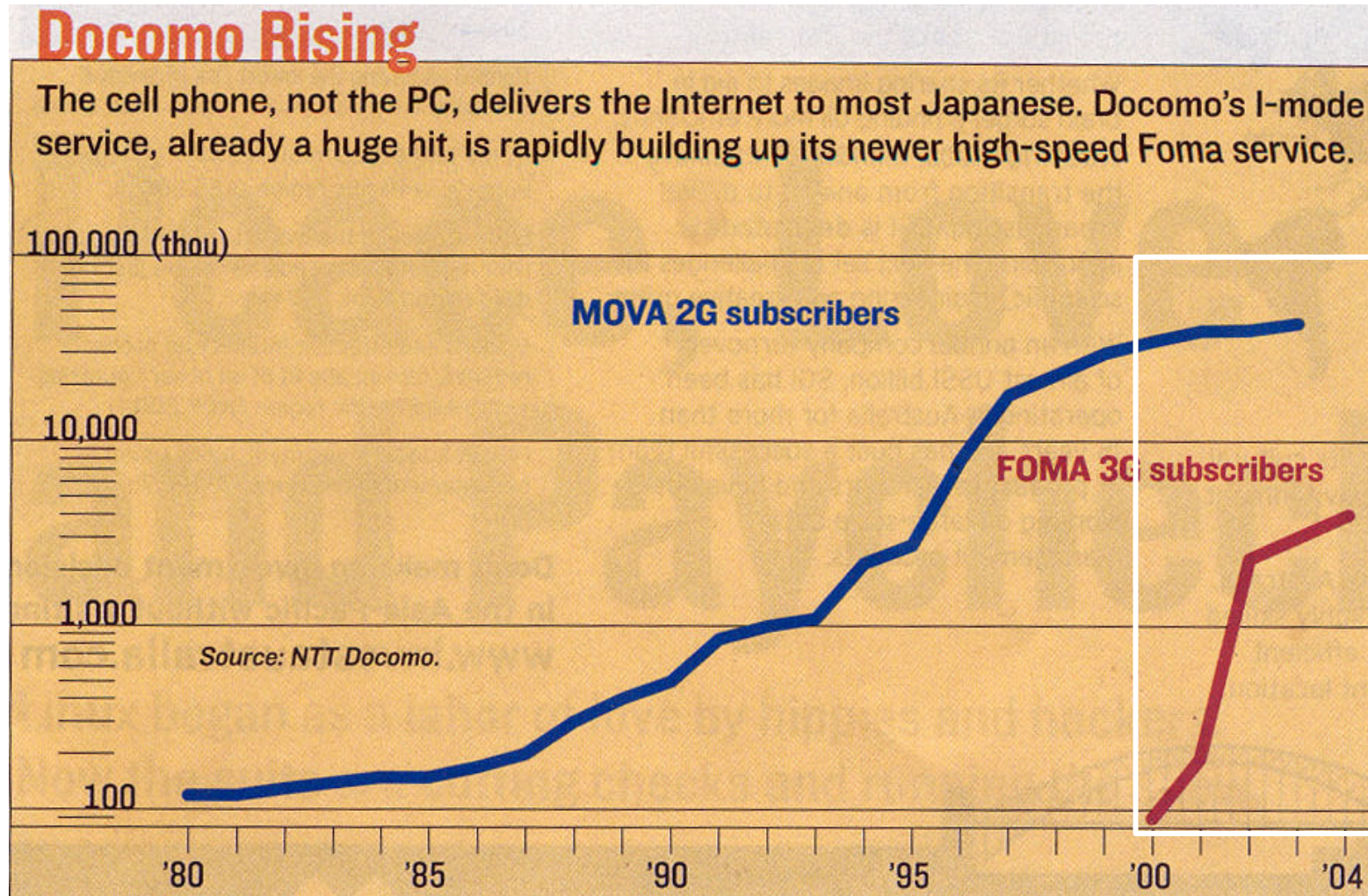


Recent examples of diffusion in telecomms - 3



Financial Times
21/9/2004

Recent examples of diffusion in telecomms - 4

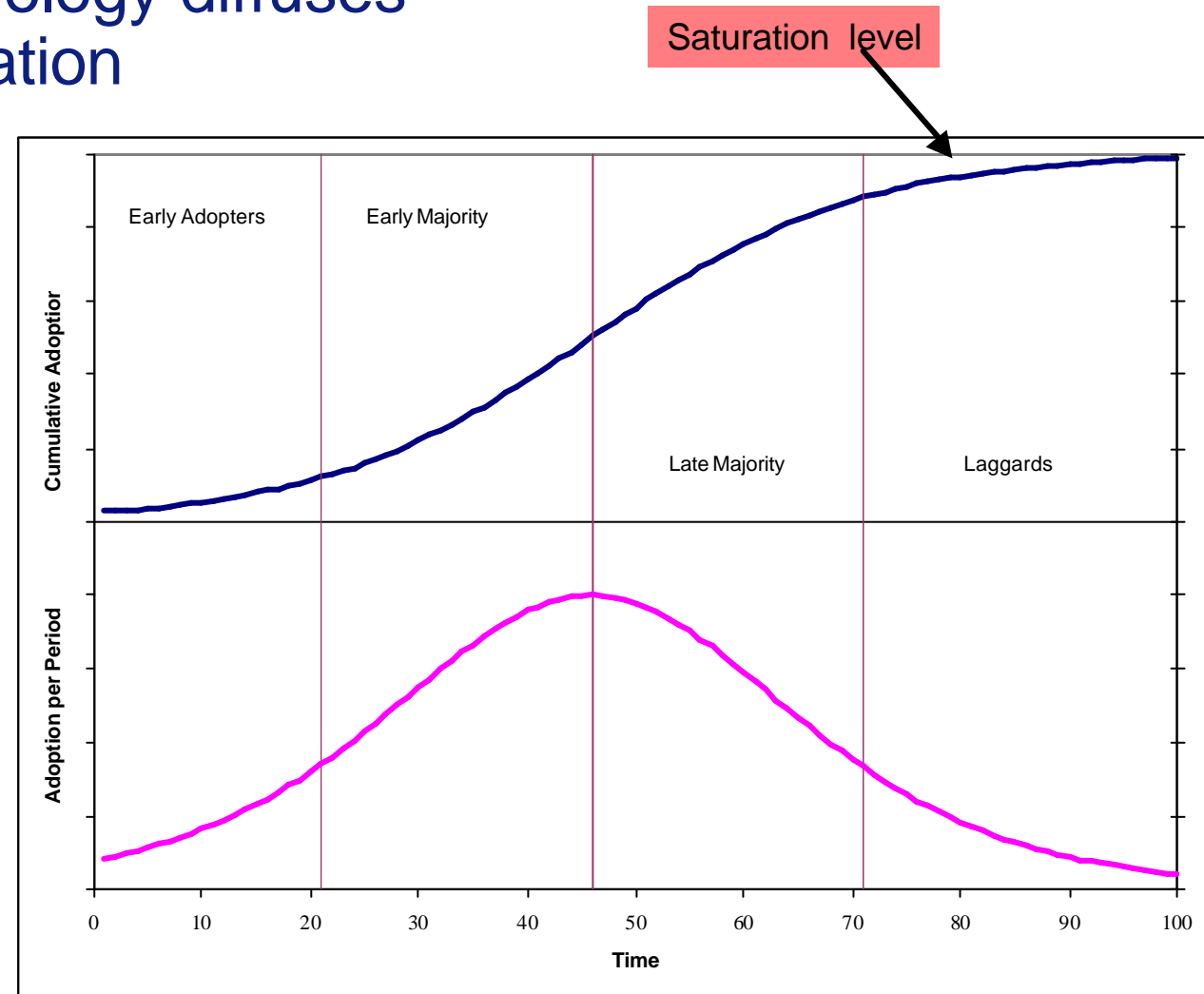


3G starts to attract 2G customers

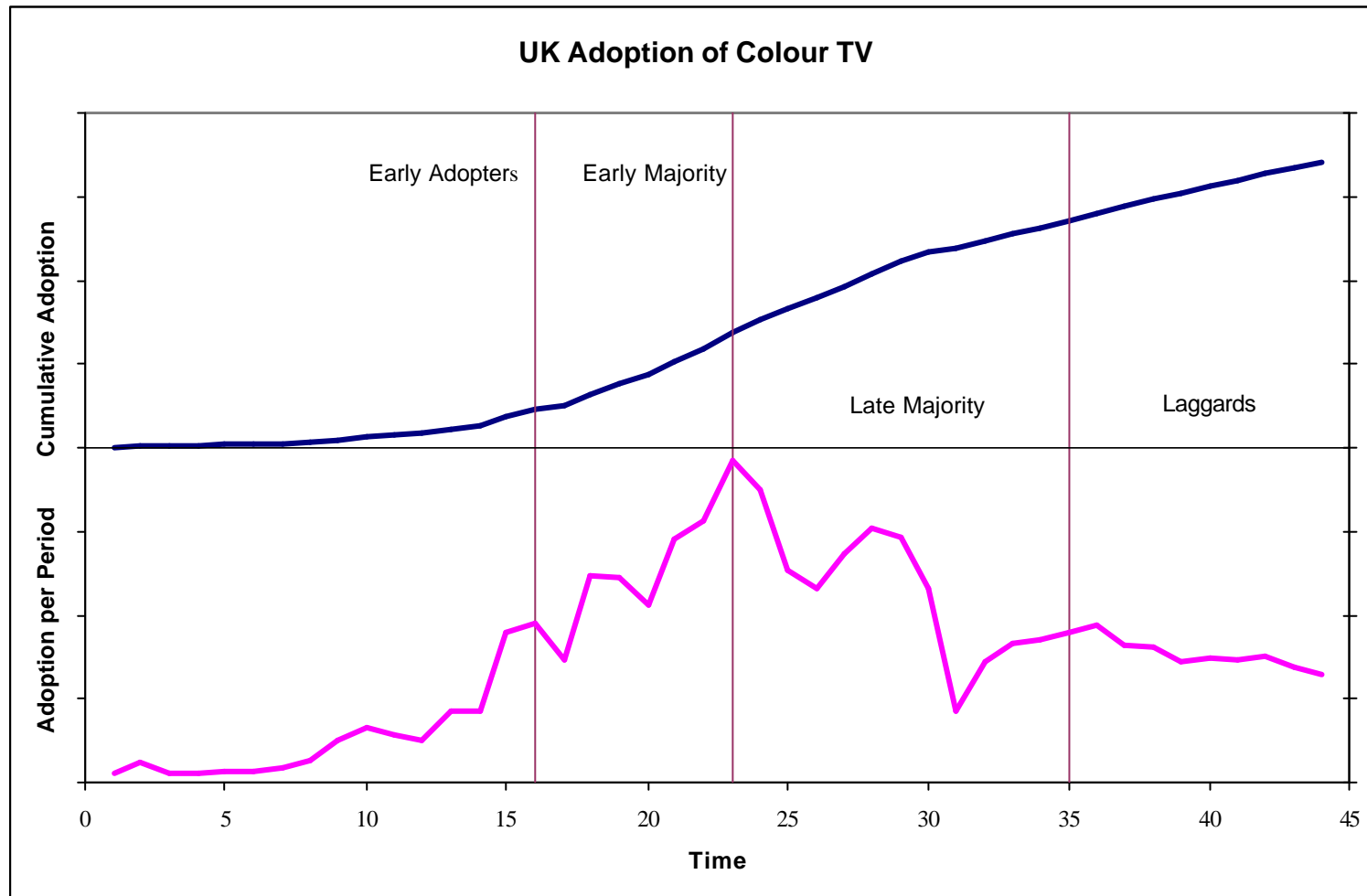
Forbes
20/9/2004

Definition of Diffusion models

- A new technology diffuses into a population



Example – UK Colour TV



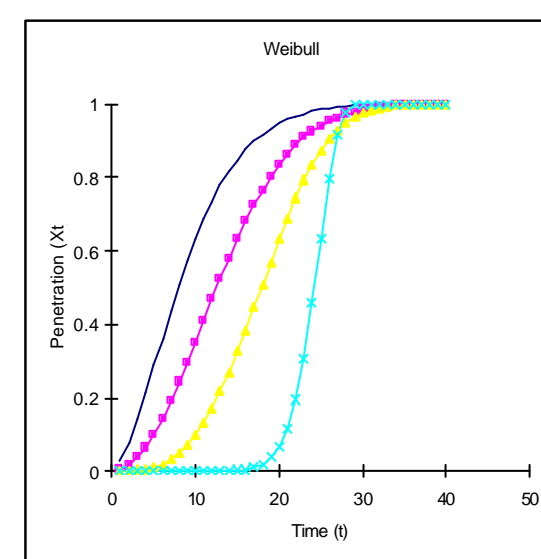
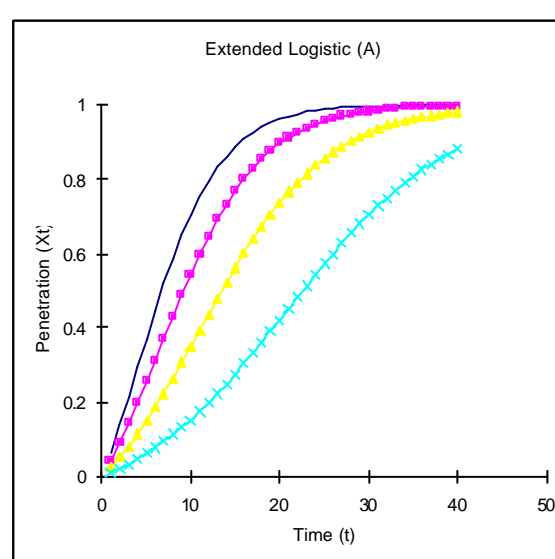
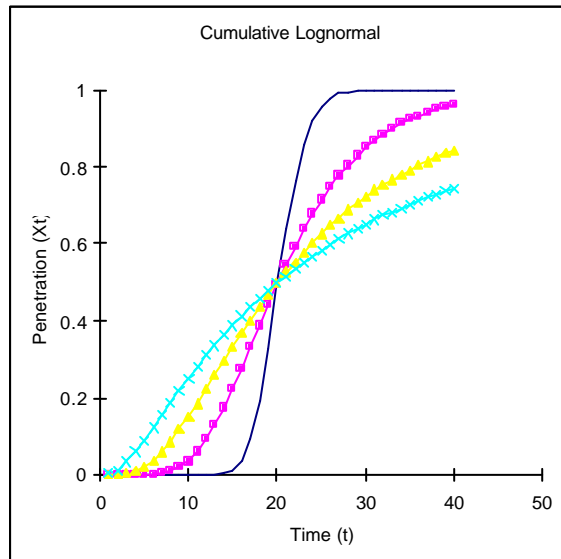
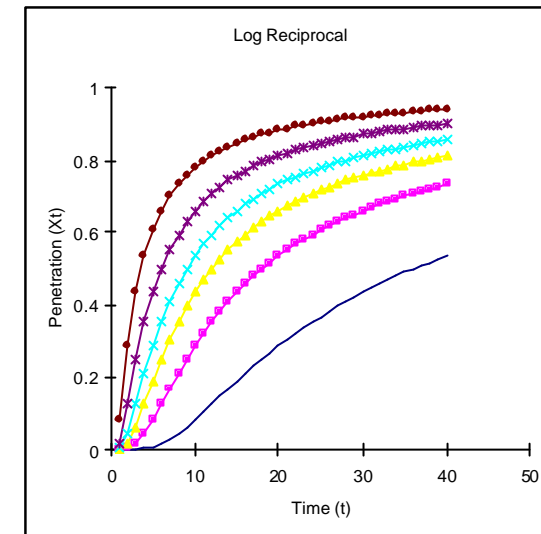
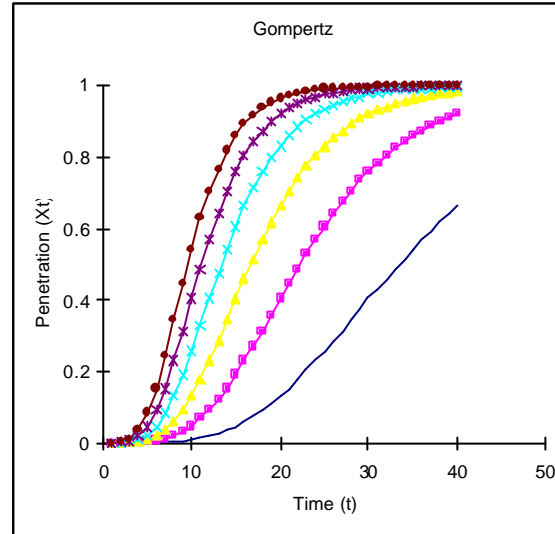
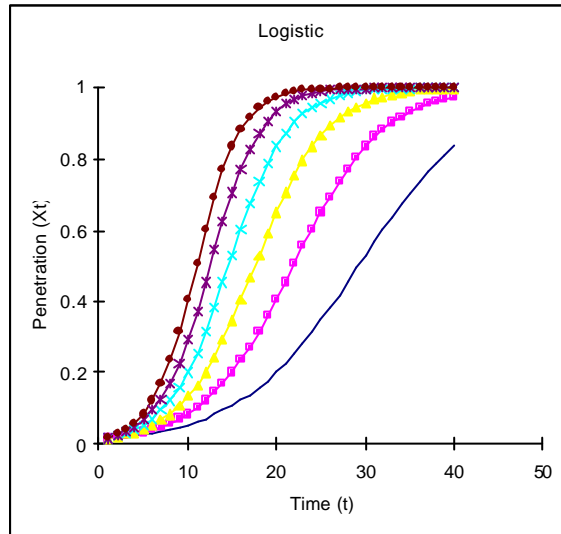
Forecasting Issues of Interest

- What will the rate of adoption be at a particular time?
- How many potential adopters are there in total?
- When will peak demand occur?
- How high is peak demand?

Problems in Forecasting

- Identify the appropriate model
- Estimate its parameters
- Predict future adoption
 - (with a prediction interval).
- Model identification is crucial
 - the literature reveals 29 possible models
 - there is no best single model

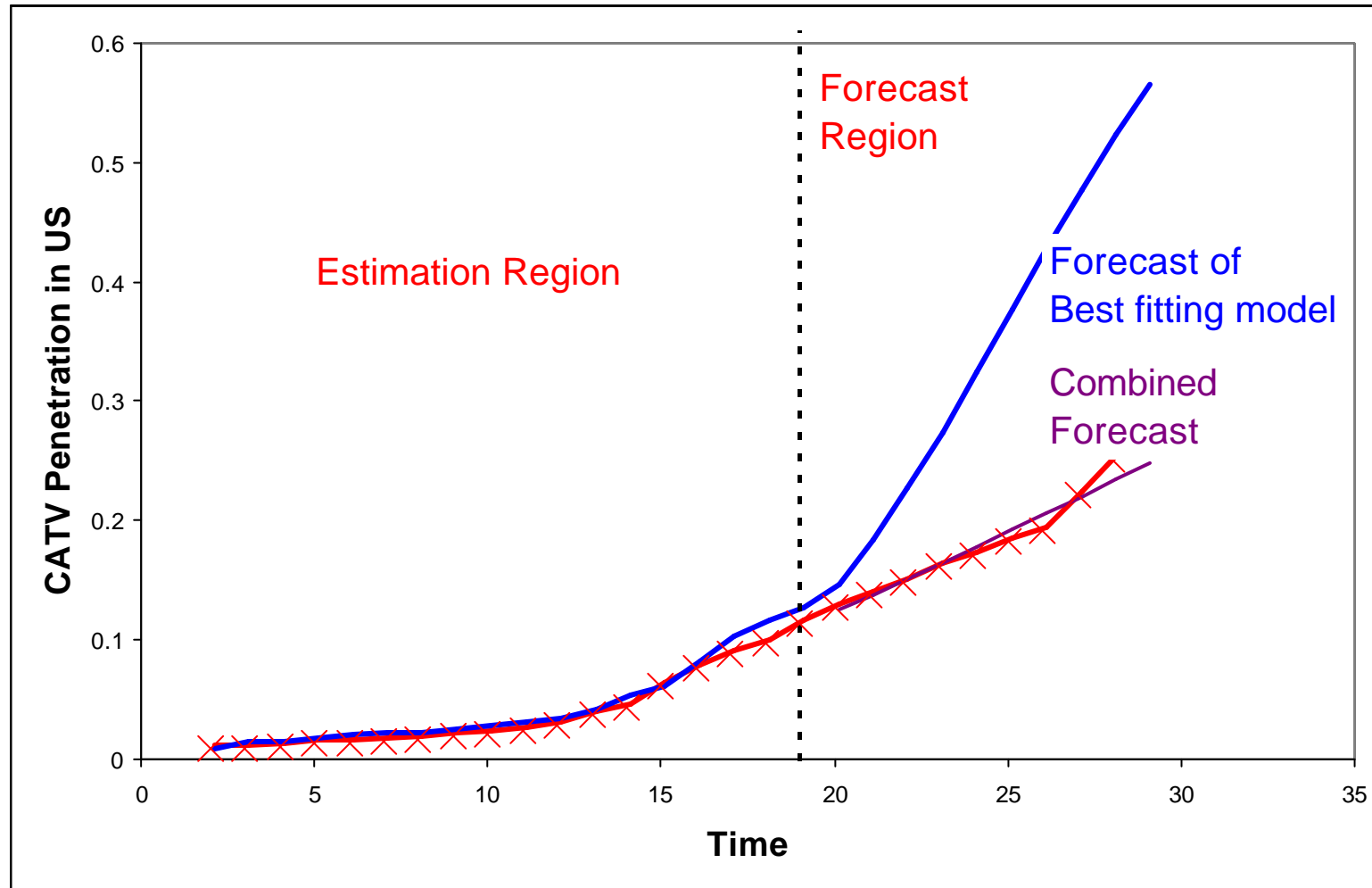
A selection of diffusion models



Model identification

- Meade & Islam (Management Science 1998)
- The best fitting model is not necessarily the best forecasting model
- They propose combining criteria based on:
 - Model fit (measured by R^2)
 - Model stability (looks at one step ahead forecasts)
- These criteria suggest a subset of models which are used to produce a combined forecast

Forecasting Cable Television Penetration in US

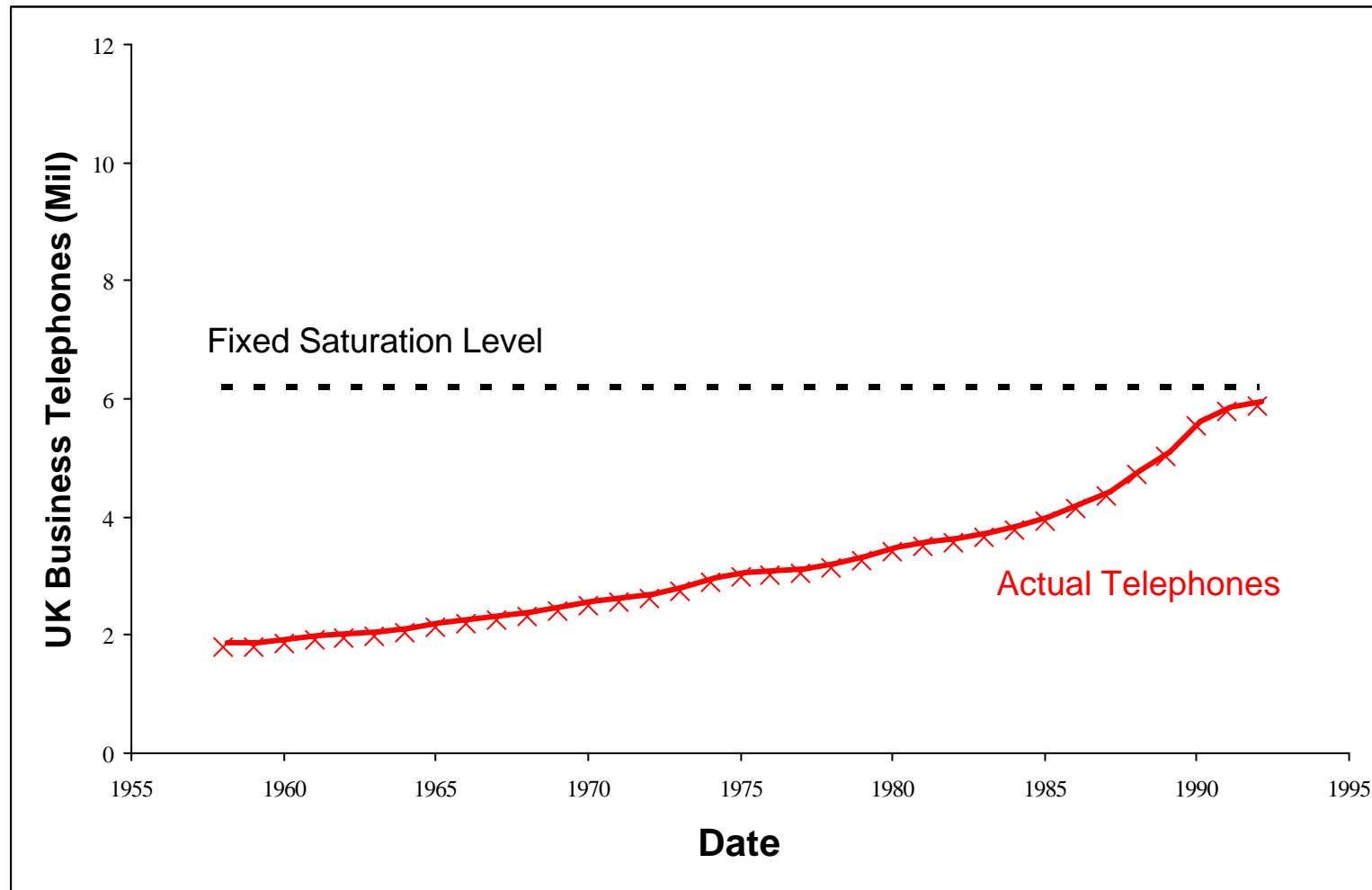


Applications in Telecomms

Variable	Author	Model
Fixed line telephone penetration	Chaddha & Chitgokepar (1971)	Logistic
	Hyett & McKenzie (1975)	Logistic
	Bewley & Fiebig (1988)	Flexible logistic
	Lee et al (1992)	Non-linear growth
	Meade & Islam (1995)	Comparison of 14 models
Business Telephones	Meade & Islam (1996)	Growth + econometric

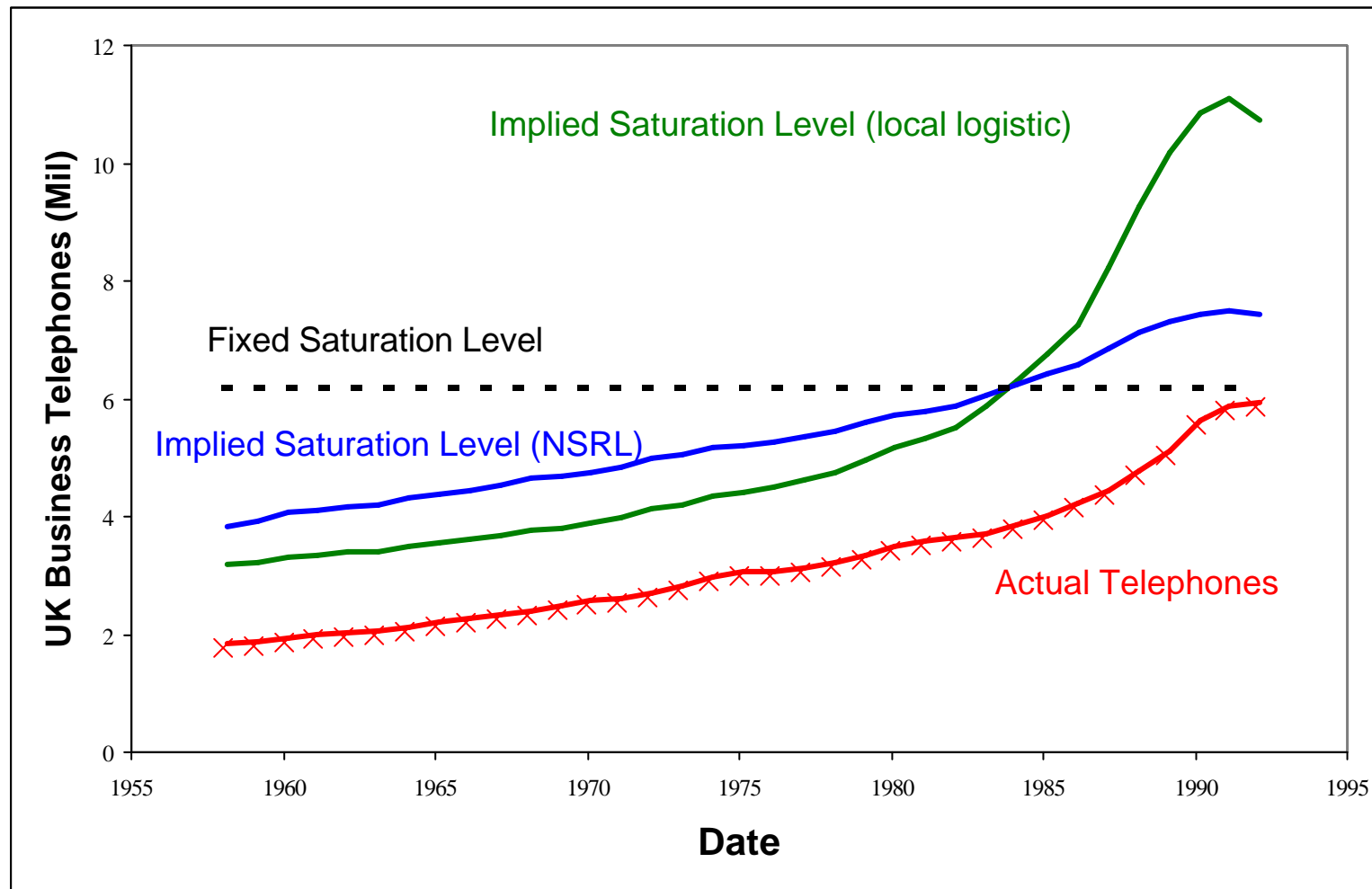
Modelling approaches

- Extrapolate from available data



Modelling approaches

- Dynamic saturation level by relation to environmental variables

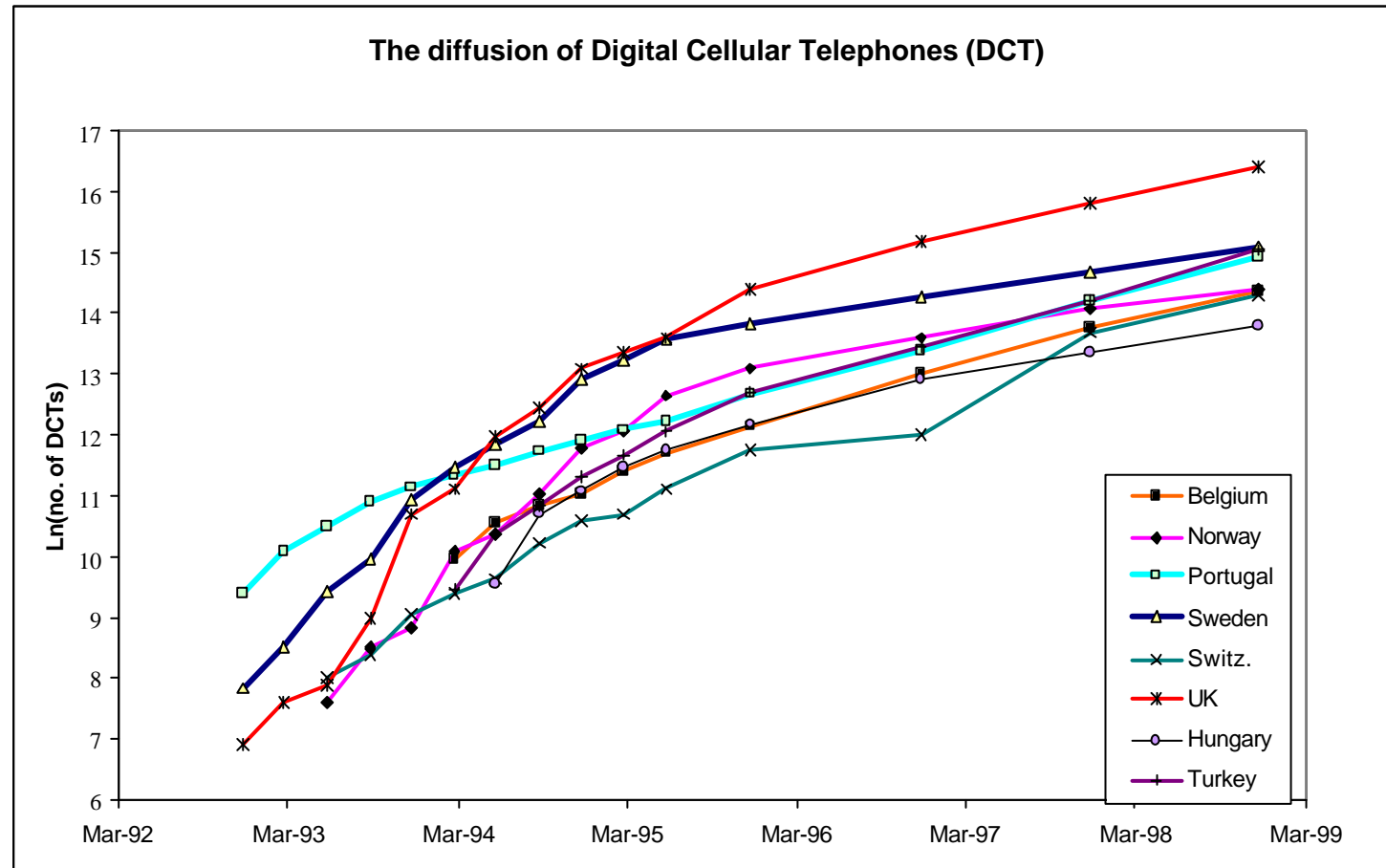


Multi – national models

- Pooling data series from several countries is used to overcome data shortage

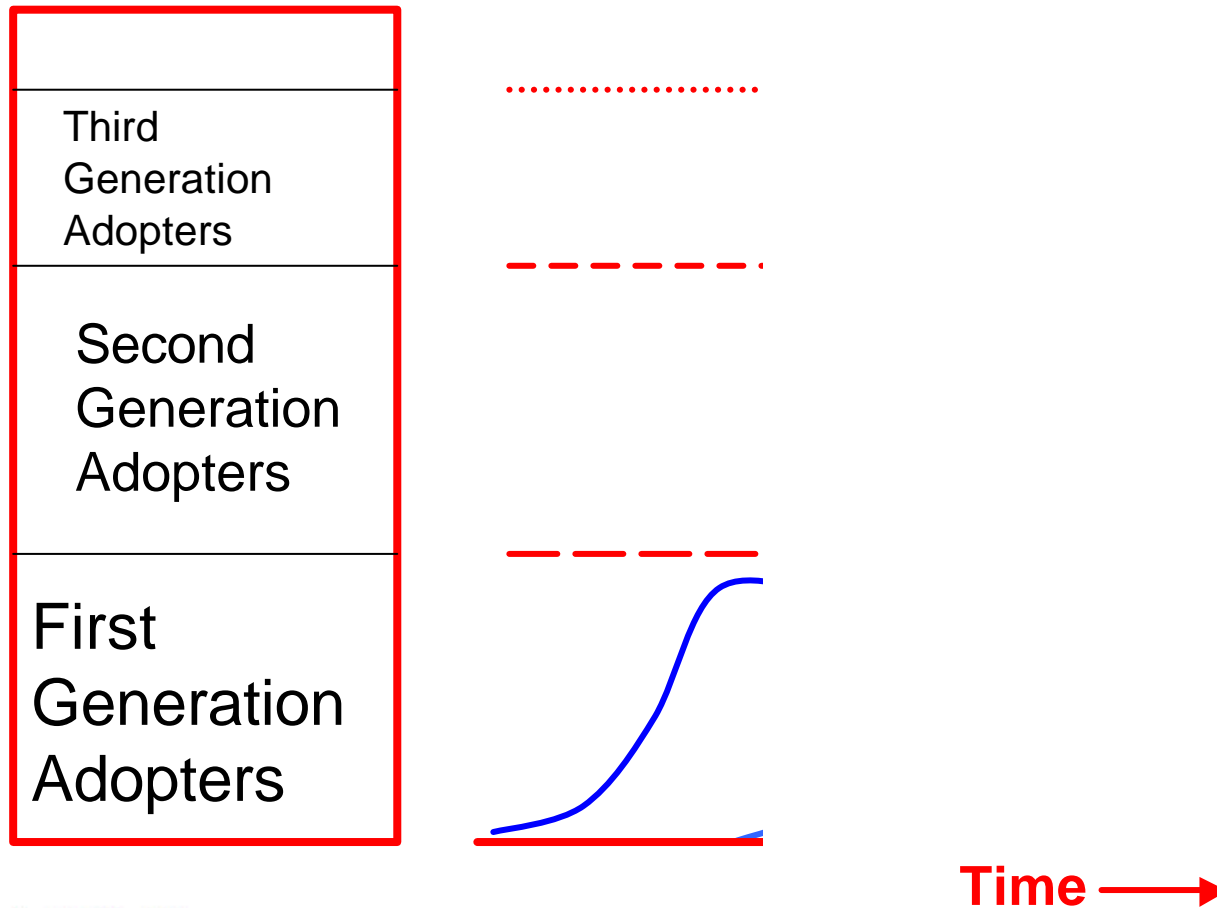
See

- Gatignon et al (1989)
- Islam et al (2002)

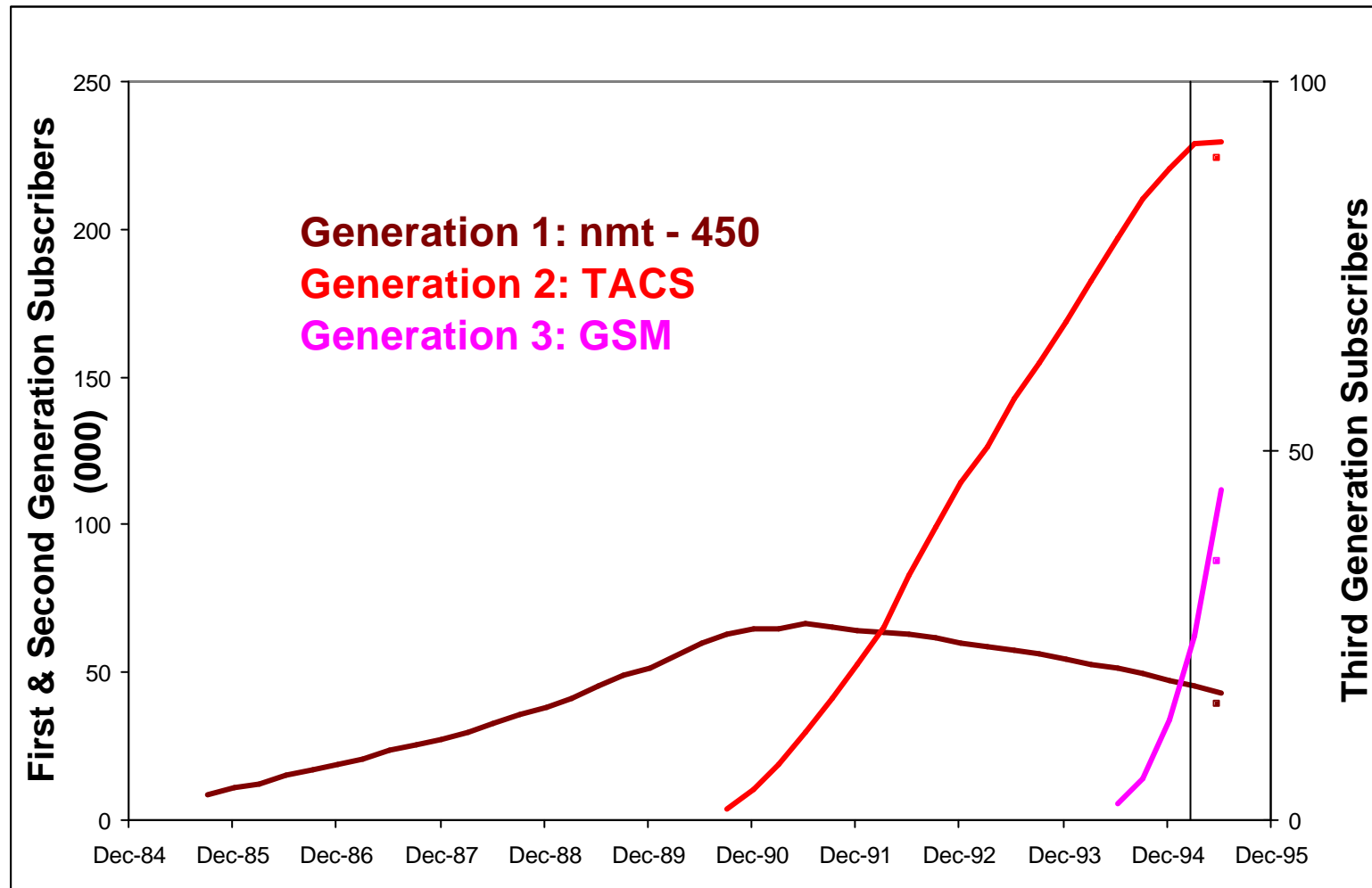


Multi – generation models

Successive Generations of Technology Islam & Meade (1997)

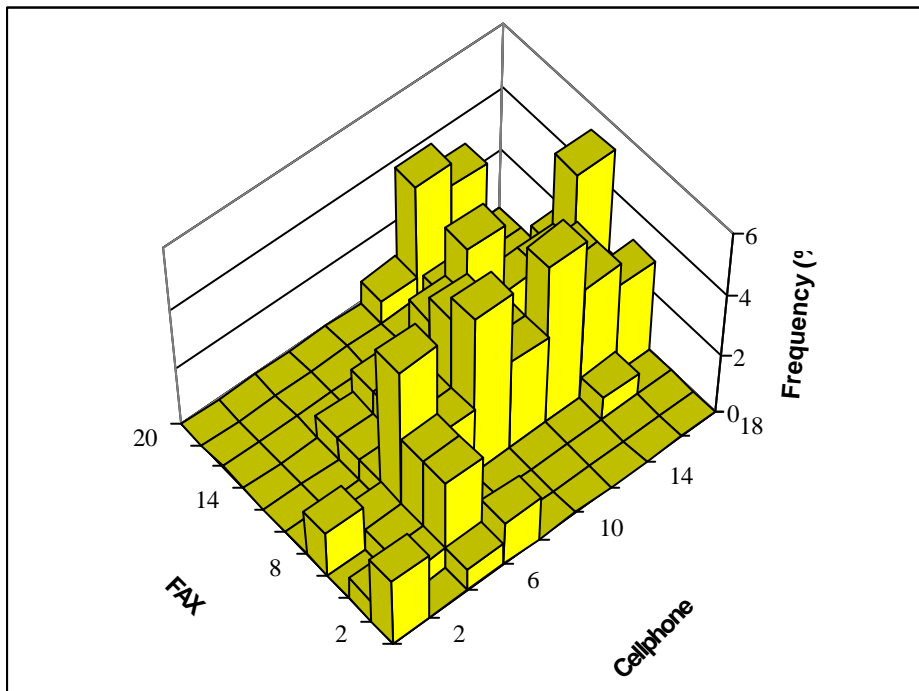


3 Generations of Austrian Mobiles

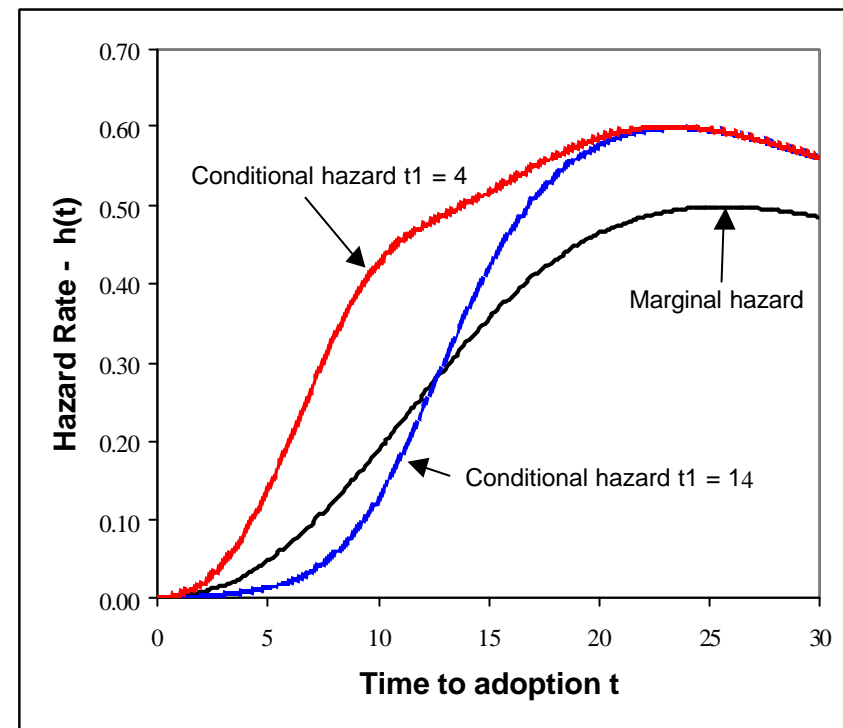


Multi – technology models

- Forecast international adoption of technology B using history of adoption of technology A (Meade & Islam, 2003)



Bivariate histogram of adoption times



Hazard rates for early and late adopting countries

Conclusions

- **Strengths**
 - Intrinsic saturation level
 - Data based – forecasts grounded on actuality
 - Prediction intervals can be provided
- **Weaknesses**
 - Data based – models prefer more data to less
 - Forecasts made before point of inflexion have high uncertainty

The end

