Forecasting Methods
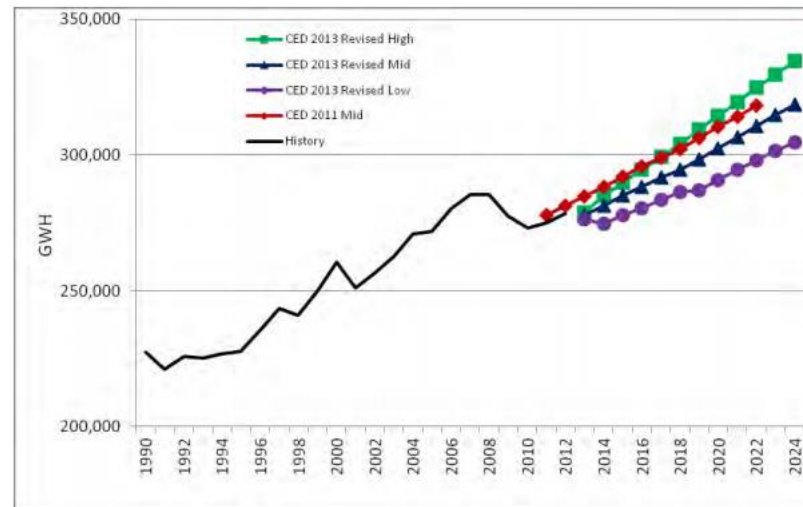
"Plan is nothing, however, planning is everything."

Rule of Thumb

"Make use of reputable studies from other institutions."

CEC electricity forecasts under various scenarios.
Image source: energy.ca.gov.

Forecasting

: the process of making predictions of the future based on past and present data and most commonly by analysis of trends

- Qualitative forecasting methods
  - Delphi, Forecast by analogy
  - Market survey

- Quantitative forecasting methods
  - Time-series analysis: Moving average, Exponential smoothing, ARIMA(Autoregressive Integrated Moving Average)
  - Causal methods: Regression Analysis, Econometric Models
  - Diffusion Curve : Logistic, Bass Models

- Artificial Intelligent methods
  - Datamining, Pattern Recognition
  - Machine Learning

Service Forecasting(An example)

Revenue, #_of_Subscribers of 7 satellite services : Historic Data

(yes)   (no)

• Time series Regression Model
- Logarithmic model : $y = a + (b \times \ln(t))$
- Inverse model : $y = a + \dfrac{b}{t}$
- Power model : $y = a \times t^{b}$
- Compound model : $y = a \times b^{t}$
- S model : $y = \exp(a + \dfrac{b}{t})$
- Growth model : $y = \exp(a + b \times t)$
- Exponential model : $y = a \times \exp(b \times t)$

• Logistic Model

$$y = \frac{M}{1 + \exp(a + b \times t)}$$

• Saturation Point
- KT people (Inside personnel)
- Analyzers(Outside personnel)

**Check Significance**

- Optimistic
- Average
- Pessimistic

Saturation Points (M)

서비스	매출액 포화치	가입자수 포화치
중계기 임대	191.5 (억)*	756 (MHz)
TSAT	30 (억)	75 (대)
TVRO	133 (억)	5300 (대)
SNG	13 (억)	300 (회)*
KMS	113 (억)	10500 (대)

(* : 한국통신의 예측값을 연구자 의견을 반영해 조정)

Diffusion Model

- Process of how **new products and services** move in the market or get adopted by consumers as an interaction between present customers and potential customers.

- the adopters of a product are influenced by two channels—Advertising & Word of Mouth
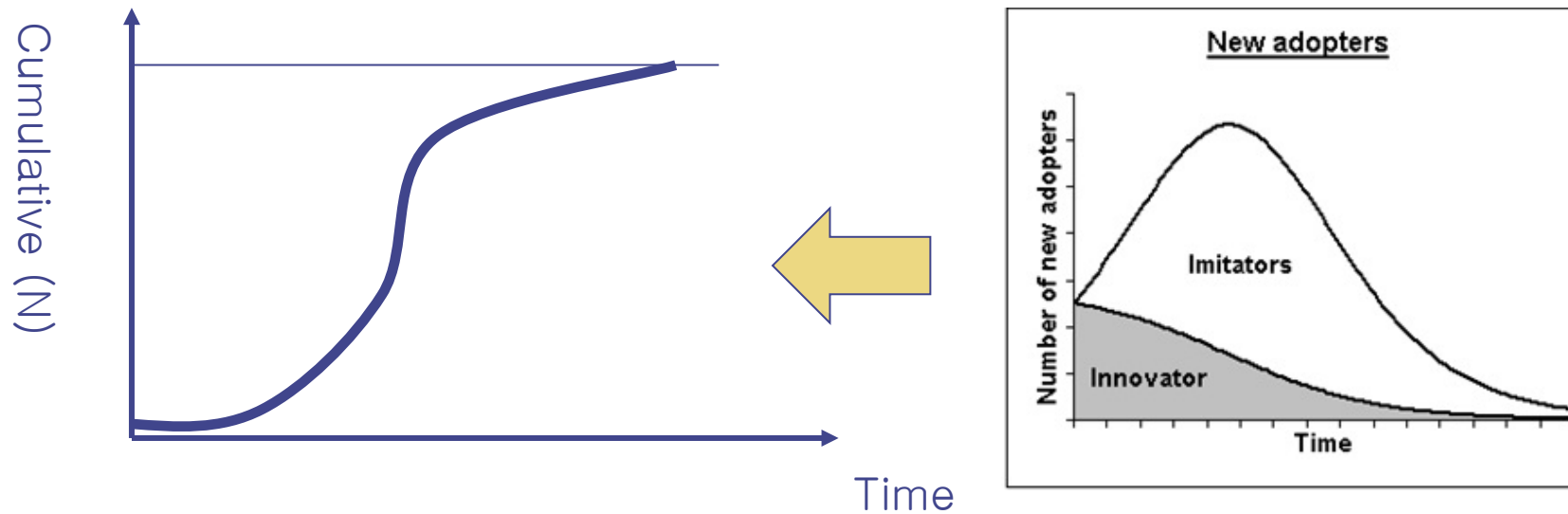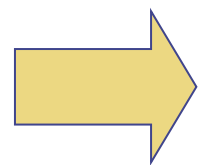
Logistic Model

$$y = \frac{M}{1 + \exp(a + b \times t)}$$

Bass Model

$$y = M \times \frac{1 - \exp^{-(p+q)t}}{1 + \dfrac{q}{p}\exp^{-(p+q)t}}$$

- presents a rationale of how current adopters and potential adopters of a new product interact
- adopters can be classified as innovators and as imitators
- the speed and timing of adoption depends on their degree of innovativeness and the degree of imitation among adopters.

$$\frac{f(t)}{1 - F(t)} = p + q \cdot F(t)$$

Diffusion Model

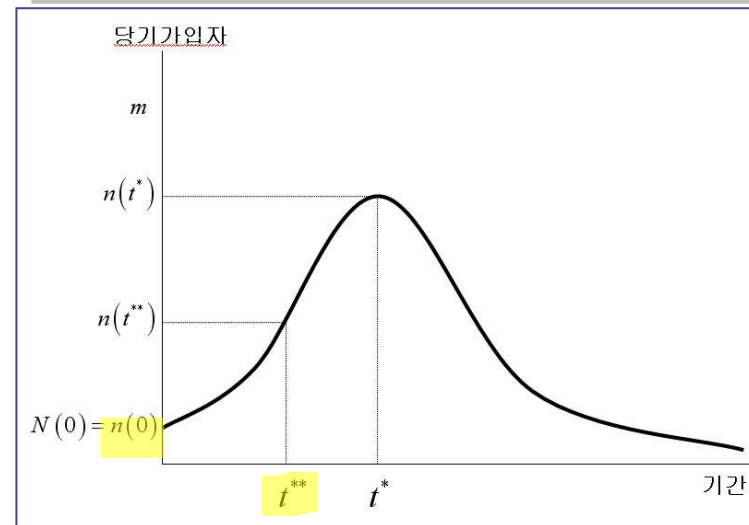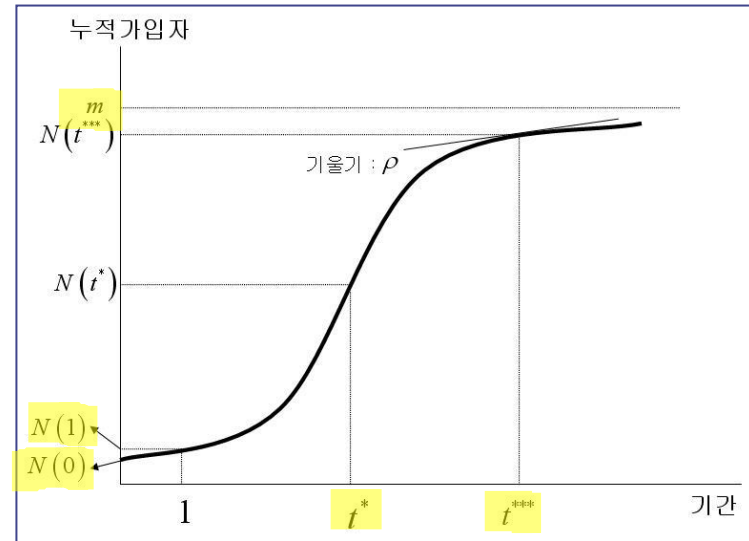- **Good for New technology forecasting**

  Graph

  t^* : Pt. of Max. net users

  t^{***} : Saturation Pt.

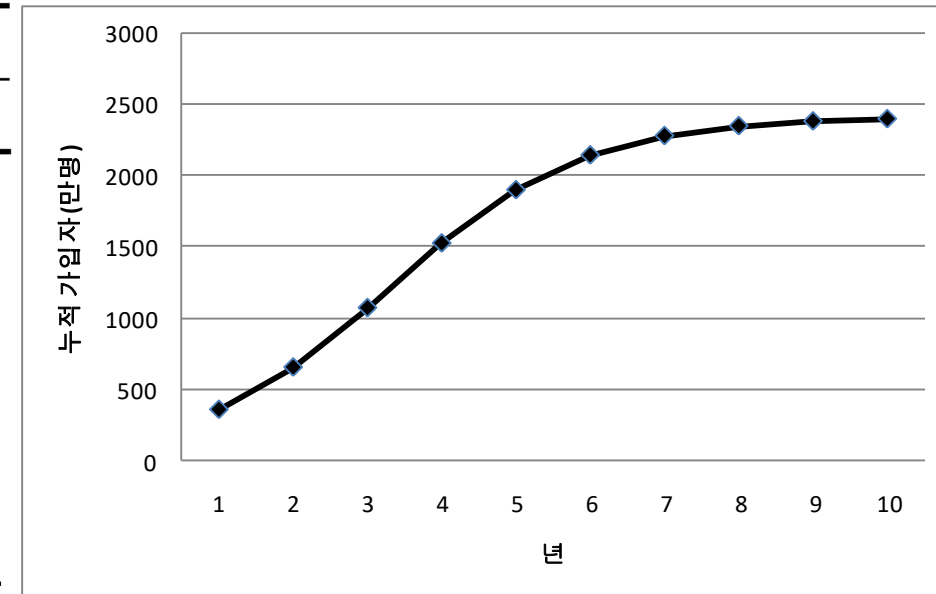 ρ : Saturation rate

  t^{**} : Inflection Pt.

Diffusion Model

An Example
- Terrestrial DMB subscriber forecasting

	M	a	b
추정치	24.15	2.535	−0.064

년	누적 가입자(만명)	년	누적 가입자(만명)
1	352.6626	6	2146.114
2	650.6031	7	2282.573
3	1069.718	8	2351.926
4	1525.45	9	2385.54
5	1901.052	10	2401.457

Diffusion Model

An Example

- Terrestrial DMB subscriber forecasting

  (※ **cf.** 50M smartphone subscribers as of 2019, 5G??)

	M	a	b
추정치	24.15	2.535	−0.064

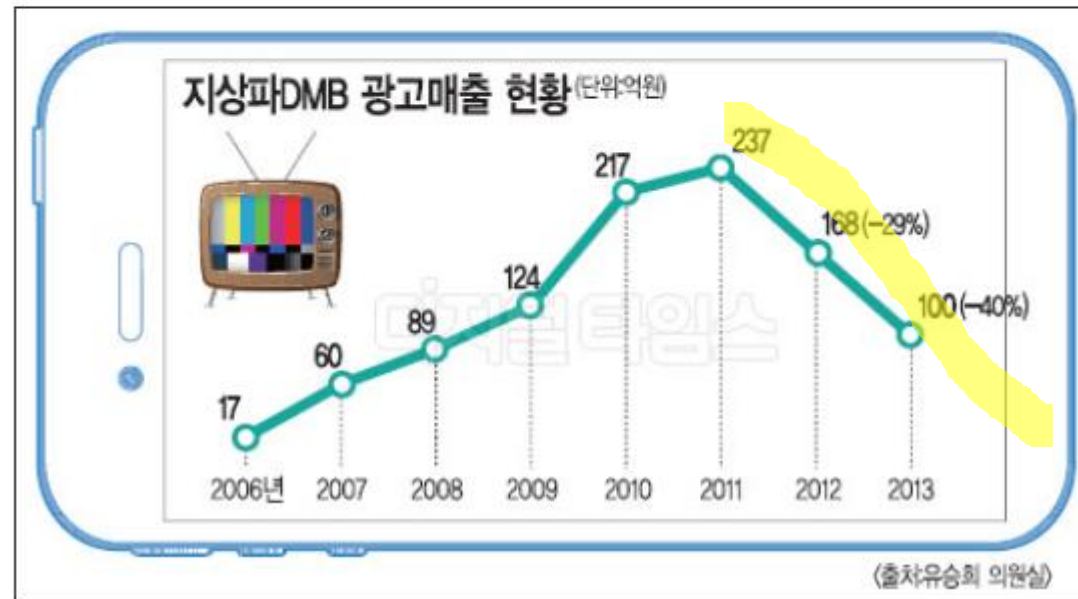| 년	누적 가입자(만명)	년	누적 가입자(만명)
1	352.6626	6	2146.114
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스마트폰 가입자수
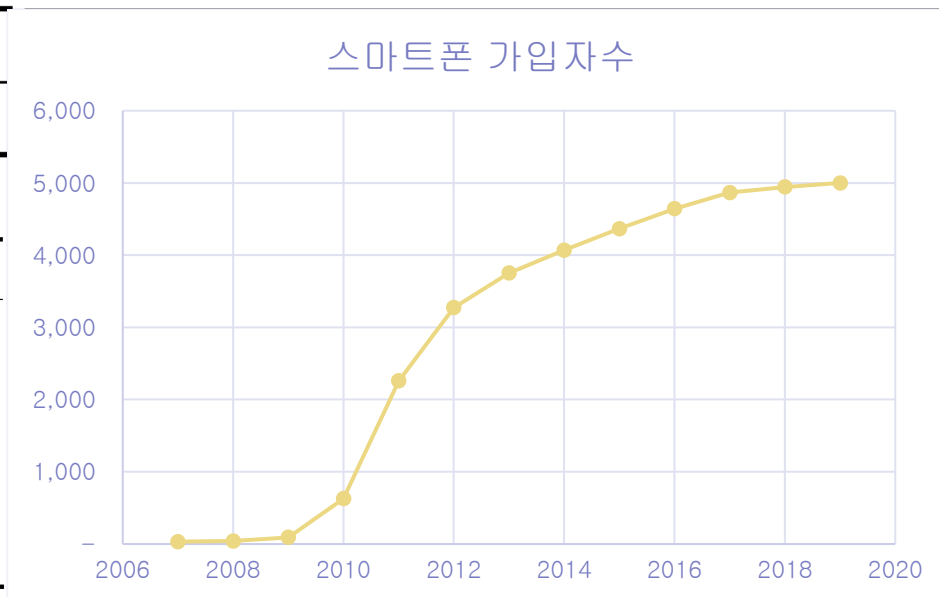
4500만 지상파DMB, 적자로 돌아선 사연

수도권 3사 누적 적자 770억… N스크린 공세에 2년새 매출 반토막

강동식 기자 dskang@dt.co.kr | 입력: 2013-10-29 20:39
[2013년 10월 30일자 6면 기사]

폰트 + − 🖨 ✉ Ｔ Ｆ Ｇ

[단독] 아이리버에서 작심하고 만들어서 난리난 블루투스 스피커

지상파DMB 광고매출 현황 (단위:억원)

- 2006년: 17
- 2007: 60
- 2008: 89
- 2009: 124
- 2010: 217
- 2011: 237
- 2012: 168 (−29%)
- 2013: 100 (−40%)
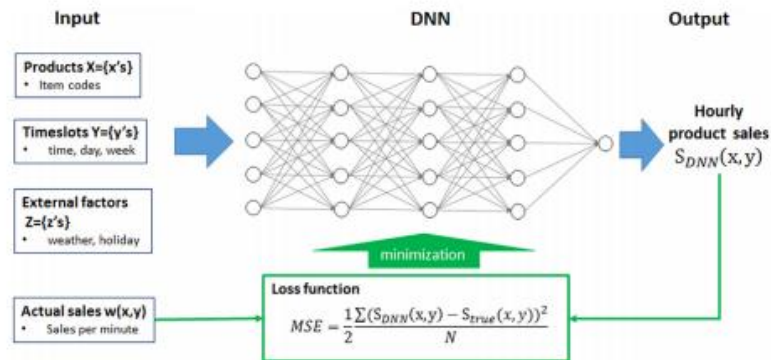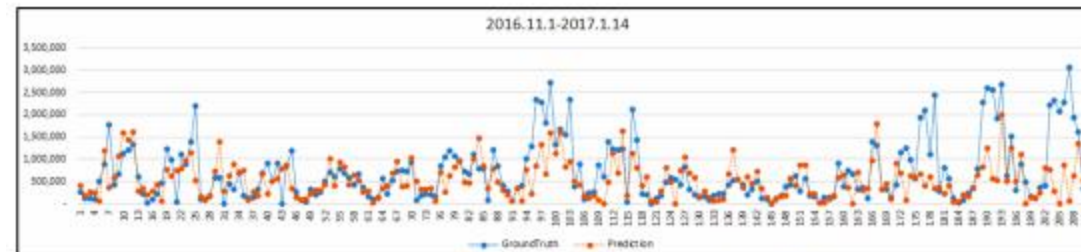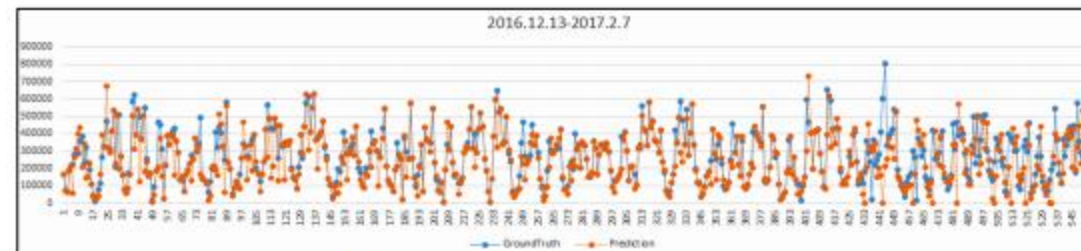
(출처:유승희 의원실)

DNN Example

그림 3 심층신경망 매출예측기
Fig. 3 DNN sales predictor

(a) Prediction of sales between 2017.1.15 and 2017.1.29

(b) Prediction of sales between 2017.2.28 and 2017.3.13

그림 8 다른 구간에서의 매출 예측과 실제 매출 비교
Fig. 8 Comparison of sales prediction and actual sales in other period