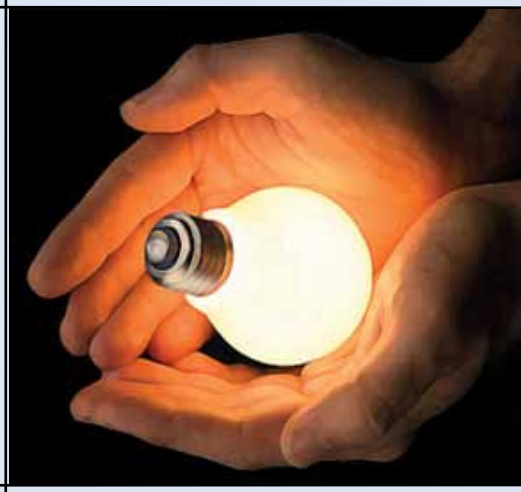
10G Roessler Rd. Suite 508, Woburn, MA 01801 – Email: markc@demandplanning.net – www.demandplanning.net

By Mark Chockalingam Ph.D.

Industry Forecasting and Market Share Modeling



White Paper

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Market Share forecasting

- Forecasting in a best practice environment is a closed-loop process.
  The consensus forecast is the combined effort of Sales, Marketing, Finance, and Operations Planning.

  In this session, we will examine how Market Research is a significant influence in forecasting.

Want to improve your process? DemandPlanning.Net Diagnostic consulting is a good place to start!

STRATEGIC DEMAND MODEL

- Ø Market Share, Consumption Modeling & Strategic Forecasting
- Ø The Analytical Model
- Ø Ship to Share

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Market Share, Consumption Modeling & Strategic Forecasting

In the Strategic Forecast process,

- Ø We incorporate the effects of changes in Market share, consumption patterns, and inventory cycles.
- Ø Inventory cycle is defined as the trend to accumulate or reduce inventory.
- Ø Demand is modeled as the change in inventory at retail plus retail consumption.
- Ø In the planning process, this model helps us plan our promotional spend in the context of market trends and developments and also monitor inventory risk at the trade.

The Analytical Model

- Ø The market share model is founded on
  - top line sales growth derived from
  - retail consumer take-away.
- Ø In the long-run,
  - Shipments to trade = POS at Retail
- Ø The consumption forecast model is based on
  - Category growth and
  - Market share … **to**
  - Derive Retail take-away

Ship to Share

- This model is called
  - Ship-to-Share forecasting model
  - Market Share Model
  - Strategic demand forecast model
- The Ship-to-share model is used to...
  - Analyze and forecast market share in the context of category growth
  - Determine our shipments required to achieve our forecasted retail sales based on the market share and stated trade inventory objectives
  - Monitor product lifecycles and make new product investments in growth categories and
  - Increase the Market share in mature categories

Share and Consumption Calculations

Consumption Estimates of Brand A				
	1999	2000	2001	2002
Market size	110	140	158	180
(millions of units)				
YOY growth %		27%	13%	14%
Market Share	50%	59%	58%	62%
Consumption	55	82.6	91.64	111.6
(millions of units)				
YOY growth %		50%	11%	22%

How do you measure value chain performance? Find out at the DemandPlanning.Net metrics workshop!

CONCEPT DEFINITIONS

- Ø Business/ Brand Growth
- Ø Category Growth
- Ø Evaluation Index/ Share Growth

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Business/Brand Growth

Mathematically,

$$BG = (1+CG)*(1+SG) - 1$$

Business Growth = Category Growth * Share Growth

- Business Growth or brand consumption growth is the product of market growth and share growth.
  - Category Growth is due to Demographic factors and innovation
  - Share Growth is based on Marketing initiatives

Calculation of Business Growth

Business Growth for Brand A				
	1999	2000	2001	2002
Market size (units in mm)	110	140	158	180
YOY growth %		27%	13%	14%
Market Share	50%	59%	58%	62%
YOY growth %		**18%**	**-2%**	**7%**
Consumption (units in mm)	55	82.6	91.64	111.6
YOY growth %		50%	11%	22%
Business Growth		50%	11%	22%

Category Growth

- Category Growth or Market Growth is a model variable
  - predicted mostly by external factors
  - Outside the control of the corporate decision maker (in most cases)
  - Question:
    - When is this not true?

If the share is large enough to impact the market size, then new launches within the market or innovation will increase the market size.

An example is the launch of the Apple iPhone which may increase the market for mobile phones, if it brings in new users into the mobile phone market.

Examples:

- Growth in Allergy category due to the migration of US population to the South
- Growth in Electric Shaver Market due to more busy lifestyles
- Growth in Flash Memory Market due to increase in popularity of cell phones and PDAs

Category Growth

Ø Estimating Category Growth

- Proprietary Market Research

  Predictions for growth in online retail, dotcom booms and bombs etc.

  Examples:

  - Ø Gartner Group on trends in the technology market.
  - Ø Economic Indexes to model economy sensitive markets like the automobile market

- Demographic Factors - Based on the principle of what happened in the past will continue in the future

  Examples:

  - Ø the graying of the US population
  - Ø Trend towards moving South and to the Coast

Estimating Category Growth

- So How will you estimate Category Growth due to Demographic Factors? How will you model the graying of the US population *over time* ?

Why are time-series techniques better?

Answer:

- Time Series Techniques
- Demand = a + b**t* + d(Seasonal Index) + e
  - Where *t* is the time trend
  - the model may be a function of time and seasonality.
  - There may be cyclical effects in the model.

Estimating Category Growth - Model

Why is this simpler, and will this work?

Ø Problem:

Market for Cholesterol drugs is heavily dependent on the average age of the US population. How do you predict the market for these drugs in the future?

Multiple Linear Model:

- Market = $a + b*(t) + d_1(\text{Age}) + e$ ----- Model 1
- Age = $a + b*(t) + e$ ----- Model 2
- Since Demand is a function of Age, for forecasting demand for drugs, we need future values of Age.

Easier Solution to Estimating Category Growth

- Market Size = a + b*(*t*) + e

  where:

  - a is the model constant
  - ***t*** is the time trend and
  - b is the unit growth in market per period and
  - e is the random error

Why is this simpler, and will this work?

Evolution Index / Share Growth

Mathematically,

$$SG = (1+BG)/(1+CG) - 1$$

Evolution Index = Own Growth / Category Growth

- If consumption grows YOY faster than Market growth
  - The business is experiencing share growth and
  - EI greater than 100.
- Consequently, Share loss implies EI lower than 100.

Calculation of Evolution Index

Evolution Index for Brand A				
	1999	2000	2001	2002
Market size (units in mm)	110	140	158	180
YOY growth %		27%	13%	14%
Market Share	50%	59%	58%	62%
YOY growth %		**18%**	**-2%**	**7%**
Consumption (units in mm)	55	82.6	91.64	111.6
YOY growth %		50%	11%	**22%**
Business Growth		**50%**	11%	22%
Evolution Index		**118%**	**98%**	**107%**

RETAIL CONSUMPTION MODEL

- Ø Retail Consumption Model
- Ø Strategic Demand Model
- Ø Model Parameters
- Ø Model Explained
- Ø Value Share

Retail Consumption Model

The Model:

Retail Consumption = Sensitivity to category + Share Changes based on Impact of Marketing Initiatives

Ø Constraints

- Maximize Share Growth subject to the cost of Marketing initiatives
  - ØAt the Margin, incremental profit on additional demand equals marketing cost.
  - ØFounded on the basic economic principle, MR=MC.

Strategic Demand Model

- Multiple Linear Model:
  - $SD = a + b*(C) + d_1(MI_1) + d_2(MI_2) + e$
  - C is the size of the Category
  - MI are the different Marketing initiatives
    - These are corporate policy variables
    - Future values are determined by the business internally
  - Possible to assume category growth is a function of MI as well.
    - Why?
    - If so, what will happen?

If share is large enough, own demand will impact market size. In that case, market size will drop out of the model

Model parameters

$$SD = a + b*(C) + d_1(MI_1) + d_2(MI_2) + e$$

- a is a constant estimated by the consumption data.
- **b** is the sensitivity to changes in category. Also termed Market Beta
- d_1 is the demand elasticity metric in relation to Marketing initiative 1.
- d_2 is the demand elasticity metric in relation to Marketing initiative 2.
- The elasticity metric defines the amount of influence the Strategic Planner has in stimulating demand using Spending Budget.

Model Explained

$$SD = 250000 + .5*(C) + .25*(MI_1) + 2*(MI_2) + e$$

- Ø a = 250000 is the level consumption for this brand.
- Ø **b = .5** is the sensitivity to changes in category.
  - 1% change in market will result in .5% change in consumption.
- Ø $d_{1 = .}$ **.25 and** $d_{2 = .}$ **2**
  - $1 increase in Ad spend will result in a .25 unit increase in consumption
  - $1 increase in Store spending will result in $2 unit increase in consumption

Value Share

- How do we derive Value Share instead of unit Market Share?
  - The building block is unit consumption forecasting and method to derive unit share.
  - Use a naïve time-series of average prices by month and forecast out expected future price
    - Average monthly price = EQ Sales dollars / EQ Sales units
    - Average category price is the same derivation for category
  - Retail Value consumption is given by the product of Unit consumption and average price.

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MARKETING MIX ANALYSIS

- Ø Optimal Spend
- Ø Constrained Optimization
- Ø Marketing Mix Modeling

Optimal Spend

- The Marketing Budget can be optimized
  - by a system of models that maximize the profitability of your product portfolio
  - subject to the Budget constraint.
- By altering the ad spending levels, we can study a profile of demand and profit scenarios.

Constrained Optimization

- Assuming MI is measured by the dollars spent on specific Marketing Activity.
  - $SD = a + b*(C) + d_1(MI_1) + d_2(MI_2) + e$ Equation 1
  - Spend Budget >= $MI_1 + MI_2 + e$ Equation 2
- Using LP techniques, we can solve for funding allocations for different brands and different Marketing Programs.
- In practice this could be a complex system of equations involving multiple constraints.
- This leads us to Market Mix Modeling, which analyzes the different marketing mixes on top-line sales and profits.

In this LP problem, we are solving for M1 and M2 values not for the co-efficients. The co-efficients are already estimated by the regression modeling techniques.

Marketing Mix Modeling

- Ø The Marketing Mix Modeling will optimize the value of your limited Marketing resources
  - by evaluating different combinations of Marketing spends on sales and profits.
  - subject to the Budget Constraint.
- Ø Outsourced Research using Store level data to evaluate different programs
- Ø The Model coefficients are estimated using very granular data
  - using pooled regression models
  - over cross-section of stores and geographies and
  - over time
- Ø Using the previous results, the pooled regression models estimated the MLM as:
  - $SD = 250000 + .5*(C) + .25*(MI_1) + 2*(MI_2)$ Equation 1

In this LP problem, we are solving for M1 and M2 values not for the co-efficients. The co-efficients are already estimated by the regression modeling techniques.

Marketing Mix Modeling

- Now the Linear programming problem will solve for spending levels that will optimize your business model and maximize your profits for a given spending budget:
  - SD = 250000 + .5*(C) + .25*(MI_1) + 2*(MI_2) Equation 1
  - Spend Budget >= MI_1 + MI_2 + e Equation 2
- The system of equations will yield the value of Spending to be allocated to Marketing Initiative 1 and Marketing Initiative 2 respectively.
- In practice, several sets of alternate spending scenarios and profitability profiles are created and presented to Management
- There is a lot of judgment involved in deciding on the correct Marketing Mix.

In this LP problem, we are solving for M1 and M2 values not for the coefficients. The coefficients are already estimated by the regression modeling techniques.

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INVENTORY EFFECTS

- Adjusted Model
- Accumulation
- Reduction
- Reconciliation of the Forecast
- Steps in Consumption Forecasting

Inventory Effects

- In the purest case assuming the flow of product is smooth from factory to pantry,
  - There is no need for traffic-buffers
  - Shipment will equal consumption.
- In reality, Inventory introduces the lag effects of Retail to Factory shipments
  - Retail inventory adjustments will cause factory demand to diverge from retail consumption
  - Retail policy to either accumulate inventory or reduce it will result in significant volume shocks to the forecast
  - Question
    - Is there an alternate factor that could cause the difference between shipments and consumption?

Inventory-Adjusted Model

Ø Ship-to-Share:

- Opening Retail Inventory + Factory Shipments = Retail Consumption + Closing Retail Inventory
- Factory Shipments = Retail Consumption + (Closing Inventory – Opening Inventory)
- Factory Shipments = Retail Consumption + Inventory adjustment

Ø Questions:

- How do you obtain retail inventory at the trade?
- What matters more absolute level of inventory or change in inventory from period to period?

Inventory-Adjusted Model (contd...)

- In a perfect world, inventory adjustment is zero and Demand forecast equals retail sales.
  - Inventory accumulation trend
    - the adjustment is positive
    - higher demand forecast
  - Inventory depletion trend
    - the adjustment is negative
    - Lower demand forecast

Inventory Accumulation

- Inventory accumulation takes place when
  - Retailers make investment buys either
    - because of seasonal price discounts or
    - Load ahead of a manufacturer price increase
  - Increased distribution in more accounts or more stores in the same account
  - Retailer increases safety stock levels due to a unilateral policy change

Inventory reduction

- Retailer decreases inventory ahead of delisting the item
  - Lowers the distribution of the item
  - Lowers safety stock levels if the item is slow moving
- Slower category or declining market share
  - Possible signal of mature product at the end of its life-cycle.
  - Manufacturer proactively plans a discontinuance and monitors factory shipments to retail

Reconciliation of the Forecast

- Ø Forecast Consumption using the best-fit models
- Ø Using a time-series of inventory at retail, forecast inventory at the trade into the future
- Ø Using Monthly consumption and forecasted inventory, derive shipment forecast
- Ø Use the Bottom up factory demand plan to compare
  - Derived shipments == demand plan?!
- Ø These forecasts may differ month to month or even quarterly but within bounds
- Ø Questions:
  - Can and should they be different?
  - What would explain the difference?

Steps in Consumption Forecasting

- Syndicated Data
- Data cleansing and data mining
- Forecast Market size and consumption
- Forecast Inventory at trade
- Derive Shipment forecast and compare it to demand Plan

ABOUT US

Ø The Author

Ø Demand Planning LLC

Ø Contact us

About The Author

Dr. Mark Chockalingam is Founder and Managing Principal, Demand Planning LLC, a Business Process and Strategy Consultancy firm. He has conducted numerous training and strategy facilitation workshops in the US and abroad, and has worked with a variety of clients from Fortune 500 companies such as Wyeth, Miller SAB, FMC, Teva to small and medium size companies such as Au Bon pain, Multy Industries, Ticona- a division of Celanese AG.

Prior to establishing his consulting practice, Mark has held important supply chain positions with several manufacturing companies. He was Director of Market Analysis and Demand Planning for the Gillette Company (now part of P&G), and prior to that he led the Sun care, Foot care and OTC forecasting processes for Schering-Plough Consumer HealthCare.

Mark has a Ph. D. in Finance from Arizona State University, an MBA from the University of Toledo and is a member of the Institute of Chartered Accountants of India.

About Demand Planning LLC

Demand Planning LLC is a consulting boutique comprised of seasoned experts with real-world supply chain experience and subject-matter expertise in demand forecasting, S&OP, Customer planning, and supply chain strategy.

We provide process and strategy consulting services to customers across a variety of industries - pharmaceuticals, CPG, High-Tech, Foods and Beverage, Quick Service Restaurants and Utilities.

Through our knowledge portal DemandPlanning.Net, we offer a full menu of training programs through in-person and online courses in Demand Forecast Modeling, S&OP, Industry Forecasting, collaborative Forecasting using POS data.

DemandPlanning.Net also offers a variety of informational articles and downloadable calculation templates, and a unique Demand Planning discussion forum.

Demand Planning LLC has worked with...

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Contact Us

Mark Chockalingam, Ph.D.
Demand Planning, LLC
10G Roessler Road, Suite 508
Woburn, MA 01801

Email: markc@demandplanning.net
Web: www.demandplanning.net

Phone: (781)995-0685