Valuation of IP and Early Stage Technologies

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Agenda

• The headlines
• Myths of technology valuations
• How technology value really grows
• Applying valuation approaches
• Assessing risk
• Testing value reasonableness
The Headlines

- We’ve all heard the headlines about IP-centric valuations
  - Uber: $70 billion
  - Airbnb: $31 billion
  - Palantir: $20 billion
  - Snapchat: $22 billion
  - Pinterest: $11 billion
  - Dropbox: $10 billion
  - WeWork: $16 billion
  - Spotify: $8.5 billion
  - Theranos: $9 billion

- This is what happens when people play with OPM!
Venture Capital and Valuation

**Truth:** Venture capitalists are generally poor at valuation

- Some are exceptionally poor at it
- Many excel at putting lipstick on a pig

**Kauffman Foundation published stinging indictment in 2012**

- Most VCs cannot beat public capital markets
- Since 1999 VC funds have barely broken even
- More VC-backed new companies fail than succeed
- Since 1997, VCs consumed more cash than they returned
- VC funding is the exception and not the norm for startup companies
True Story About Valuation

• Perfect early stage case study
• Product
  – Discovered: 1985
  – Patent issues: 1993
    • 10 pages
    • About 4,400 words
  – Market launch: 1997
• Key claim:
  – \[R-(R^*,R^*)]-2-(4-fluorophenyl)-\beta.,\delta.-dihydroxy-5-(1-methylethyl)-3-phenyl-4-[(phenylamino)-carbonyl]-1H-pyrrole-1-heptanoic acid or (2R-trans)-5-(4-fluorophenyl)-2-(1-methylethyl)-N,4-diphenyl-1-[2-(tetrahydro-4-hydroxy-6-oxo-2H-pyran-2-yl)ethyl]-1H-pyrrole-3-carboxamide; or pharmaceutically acceptable salts thereof.
True Story About Valuation

• **Economics**
  
  – Revenues: >$125B by 2011
    
    • Peak at $12.8B
    
    • Fortune 180 business by itself!
  
  – Gross margins > 90%

• **Most valuable product ever produced...**
  
  – More valuable than many companies in S&P 500
  
  – ...and **COMPLETELY** worthless on 6/28/2011

• **And the product is...**
Technology/IP Bridge

- Most technologies have intellectual property roots
- Why?
  - Without IP protections, reasonable business person wouldn’t buy
  - Could just copy without recourse
What is IP?

• Generally 5 types
  – Trademarks
  – Copyrights
  – Patents
  – Trade secrets
    • Formulas, processes, devices, or other information
  – Rights of publicity
    • Governed by state law
    • Properties similar to copyrights and trademarks

• All may have economic value
  • Examples today draw from patents
About Patents

• Advantages
  – Exclusive right to exclude someone from practicing invention in market
    • Not a guarantee to make money
  – Protects something functional or utilized
    • E.g., New engine design, barcode technology, drug compound, genetically modified seed, etc.
  – Allows for abnormal market profits
    • Inherent in monopolistic nature of patent
    • Patent owner can price skim if patent utility presents a strong value proposition
  – Treble damages for willful infringement
About Patents

• **Disadvantages**
  
  – **Expensive**
    • One patent can cost $10,000-$50,000
    • An international patent can cost $250,000 or more
  
  – **Short economic life**
    • Typical statutory life is 20 years or less
  
  – **Disclosure requirement**
    • You teach your competition
    • Some companies are shying away from patents
  
  – **Loses value every day on a present value basis**
  
  – **Expensive to defend**
    • Typical patent lawsuit in the U.S. costs $3M or more
About Copyrights

• Advantages
  – Exclusive right protects works of authorship
    • Literary, musical, dramatic, graphics, sculpture, sound recordings, architectural works, motion pictures, etc.
  – Long statutory life
  – Cannot circumvent like a patent
    • Becomes derivative work
  – Low cost
  – Registration simplicity
About Copyrights

• Disadvantages
  – Only protects expression of an idea, not idea itself
    • Patents protect ideas
  – Difficult to monitor for infringement
    • Must constantly monitor for infringers
    • Especially for copyrights with international interest
  – Can be relatively easy to duplicate
    • Songs
    • Software programs
    • Photocopy pages from a book
About Trademarks

- Advantages
  - Explicit protection on brands, slogans, logos, etc.
  - Generally most valuable IP type in the world
  - No statutory life
  - Can create value for otherwise commodity products (e.g., table salt, diamonds)
About Trademarks

• **Disadvantages**
  
  – Can take many years to build
  
  – Can cost significant sums to build
    
    • Broad-based consumer products in the U.S. have an average budget of about $50M
  
  – Can lose value instantly
    
    • Especially in today’s connected world
    
    • Twitter, Facebook, LinkedIn, email, bloggers can disseminate information efficiently
      
      – Not always the correct information
      
      – May impair trademark even if information is incorrect
  
  • May never recover

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About Trade Secrets

• Advantages
  – Can protect any general intangible asset
    • Functional items, expressions of data, etc.
    • E.g., customer lists, chemical formulas
  – Does not require disclosure
  – May be difficult to reverse engineer
About Trade Secrets

• Disadvantages
  – No federal protection (defend in state court)
  – Could be large key-person discounts
  – Competitors could patent invention underneath you
  – Require diligent attention to non-competes and non-disclosure agreements
Valuing IP
Valuation Purposes

• Financing

• Bankruptcy
  – Technology/IP assets may be biggest assets firm owns
  – Many receivers don’t want to pay for the analysis

• Taxation purposes

• Transactions (e.g., sale)

• Controversy (e.g., quantifying damages)

• Internal reporting needs
  – Company metrics, management accounting, etc.
Setting IP Value Expectations

- Many IP owners overvalue their IP
  - Can derive from optimism bias

- Optimism bias comes from many sources
  - Costs can be greater than anticipated
  - Development schedules can be longer than anticipated
  - Market response rates can be lower than anticipated
  - Market growth rates can be lower than anticipated
  - Risk levels can be greater than anticipated

- Reality is that many IP assets carry low values

- Problem: Parties may try to drive deals more on emotional reasons than economic ones
Where Does IP Exist in Companies?

• Many businesses are nothing more than portfolios of IP
  – Shared ownership like some corporate conglomerate
  – In many cases, tangible and real property value is *de minimis*

• Examples:
  – Pharmaceutical companies have little value without patents
  – Intel’s microprocessors are worthless without semiconductor mask copyrights, patents, and trade secrets
  – Cisco’s routers are worthless without copyrights and trade secrets on source code
  – Movies and songs are worthless without copyright protection

• Why?
  – Without IP protections, reasonable business person wouldn’t buy
  – Could just copy without recourse
IP Value Sources

• Use of the IP
  – Direct exploitation

• Ownership of the IP
  – Provides joint venture opportunities

• IP licensing royalties
  – Additional revenue source

• Not using of the property
  – Prevent a competitor in the market
IP Valuation Challenges

- Unaffordable
- Undifferentiated
- Unproven concept
- Undercapitalization
- Unproven management
- Under budgeted expenses
- Unrealistic and overoptimistic time schedules
- UGLY!
IP Valuation Challenges

- IP value is context sensitive
- IP value measurement can be difficult
- IP has no comparable in the market by definition
- IP is generally a standalone asset
  - Lacks diversification a company enjoys
- IP discount rates not directly observable
- Competitor could attack IP protections
  - Removes enforcement lever for IP owner
- Market may find little value in utility offered by IP
  - E.g., inhalable insulin
  - More than $3B in write-downs from Pfizer®, Lilly®, Novo®
IP Valuation Challenges

• Subsequent events
  – Unfavorable post-launch clinical studies
• Merck® pulled blockbuster Vioxx® in 2004
  – New study showed increased risk of heart attack and stroke
  – Cost Merck® nearly $5B
• Pfizer® pulled Bextra® in 2005
  – Link made to fatal skin condition
  – Bextra had 2004 sales of $1.3B
• Tylenol® product tainting (survivor)
• Encaparin® alleged product tainting (dead product)
Value Expectations
• **Question:** What is the value of the asset?
• **Answer:** It depends, greatly!
• We are only scratching surface of very nuanced discussion today
The Drilldown

• Many factors affect the asset’s value
  – Especially if the assets are distressed

• Here are several important ones
  – Market relevance
  – Pool of available buyers
  – Carrying costs until a sale
  – Time to finalize the asset sale
  – Positive free cash flow potential
    • That drives value of the asset
  – Negotiating position of the seller
Market Relevance

• Is the asset relevant to the market?
  – **Patent**: Do inventions claimed in the patent utility bring value?
  – **Copyrights**: Do the copyrighted works bring joy, solve a problem, or create some other perceived value?
  – **Trademarks**: Do trademarks lower consumer search costs and preserve market position?
  – **Trade secrets**: Do trade secrets create economic value for the owner because of their secrecy and the associated information asymmetries?

• **Impact**: Negative responses to these questions may indicate little value
Available Buyer Pool

- Asset buyers may ask many of the same questions we discuss today
- Generally fewer buyers for distressed assets compared with non-distressed assets
- Value to particular buyers can vary dramatically
- **Impact:** Fewer buyers leads to fewer offers and less competition to drive asset prices up, so values are lower
Carrying Costs Until Sale

• **Carrying costs factor into equation**
  – Accrue as negative cash flows against any eventual sale amount
  – Note: discount rate for these expenses is lower than that for asset sale amount because of different risk profiles

• **Examples include:**
  – Patent maintenance fees
  – Minimum royalty commitments
  – Professional service fees to maintain and broker assets

• **Long/costly sales cycles count against asset sale proceeds**
  – Costs continue to accrue

• **Impact:** The larger the carrying costs, the smaller the resulting value
Time to Finalize Asset Sale

• Time is the enemy in valuation
  – Assets oftentimes have statutory boundaries
    • Economic value may end at statutory boundary
  – Primary valuation mechanism is an income-based approach
  – Income-based methods should model time sensitivity
    • Oftentimes, they do not

• Discount rates are high
  – Compounds impact of long times to finalize asset sale

• **Impact:** The longer it takes to find a buyer and close a deal, the lower the asset value
Time to Finalize Asset Sale

• **Example #1**
  – Asset value: $2M
  – Discount rate: 35% (we are well beyond public company risk profiles here)
  – Time to find a buyer: 1 year
  – Present asset value: $1,481,481

• **Example #2**
  – Time to find buyer: 2 years
  – Present asset value: $1,097,393

• **Note that simple example does not include:**
  – Loss of statutory protection
  – Changes in market dynamics
Positive Free Cash Flow Potential

- Assets that have large positive free cash flow potential should command higher values
  - This should be intuitive

- Assets that have economic damage potential are more liquid than those that do not (typically patents)
  - Especially with accrued historical damages
  - Companies pay millions of dollars for such assets
Positive Free Cash Flow Potential

- **Ideal asset value candidates:**
  - Patent-based assets
  - Read on many products, shipping millions of units annually
  - Relatively small number of licensees (<20)
  - High value/standards essentiality
  - Lots of remaining statutory protection (e.g., 6-year old patent)

- **Typical technologies that fit this paradigm:**
  - Mobile phone technologies, semiconductors, medical devices, manufacturing processes, automobile technologies, etc.

- **Impact:** Larger positive free cash flow potential attracts more buyers, drives up asset prices, and helps reduce time to sale
Buyers oftentimes have a negotiating advantage
- Especially if seller lacks/needs cash quickly
- Oftentimes, seller has a gun to the head
- Buyer has power on the time scale
  - Especially with small buyer pools
- Buyer may not actually need assets, but they are “nice to have”

The seller may lack the resources to protect the IP
- Seller may not be able to afford protracted IP litigation
Valuation Mechanics
Approaches to Value

• Cost approach
• Market approach
• Income approach
Cost Approach

• Actual cost
  — Value what it took to build the IP
  — Possible if cost data is available

• Reproduction cost new
  — Cost of reproducing new replica of IP using same or similar methods and materials

• Replacement cost new
  — Cost of reproducing similar type of IP using methods and materials with similar utility
Cost Approach

• Costs include
  – Labor
  – Materials
  – Opportunity costs (e.g., capital charges, etc.)

• Costs could be trended for valuation date

• Depreciated for obsolescence
  – Functional, economic, technological, physical
Using the Cost Approach

• Reasonable for some asset types
  – Requires technical knowledge to do so
    • E.g., Software valuation may use Constructive Cost Model (COCOMO) or others
  – Must be sensitive to labor costs
    • Does work occur in San Jose or Manila?
      – The value will depend on the costs of the labor market
    • Can makes fair market value difficult to calculate
      – Especially if it is not possible to perform work in one market versus another

• Impractical in some cases
  – E.g., if software is given away for free
Cost Approach Example

• Must look at total cost

• Hard costs
  – Labor, supplies, etc.

• Soft costs
  – Capital charges
  – Opportunity cost being out of the market
Cost Approach Example

• Hard costs: $150K
• Opportunity costs (30% foregone returns on $150K): $45K
• Total nominal cost: $195K
• Time out of the market:
  — Present value of product was $1.09M
  — Takes one year to develop it
  — Time out of the market is worth $272,189
• Total value indication: $467,189
Cost Approach Problems

• The cost approach is inappropriate for most assignments
  – Cost and value are disjoint concepts
  – Typically horrible indication of true value
• No weight for future income potential
• Patent/copyright/trademark is a legal right to exclude
  – IP rights exclude unauthorized reproduction
  – **Any reproduction is infringement**
  – Negates entire premise for reproduction or replacement cost determination
• Managers should generate returns in excess of costs
  • If manager’s cannot exceed costs, then business is unprofitable
• Also, history can be a terrible value indicator
Historical Performance

• Relying on historical performance can be very bad value indicator

Anatomy of a Blowup

• Look familiar?
Market Approach

- Comparable businesses
- Rules of thumb
  - Anything goes
  - Not a credible valuation method
Comparable IP Valuation Methods

• **Common uses**
  – Commodity products (e.g., gold, corn, labor hours, etc.)
  – Durable goods (e.g., cars, houses, art)

• **Thought process is this:**
  – If the market paid $X once, it may pay $X twice

• **Mechanics**
  – Study market rates for “comparable” transactions
  – Use those transactions as a proxy for value
Comparable IP Valuation Methods

• Basic presumptions
  – Price equals value
    • It does not
    • Price is what you pay
    • Value is what you get
  – Economic lives are similar
  – Free cash flow potential is similar
  – Timing of the products in the market is similar
  – Risk associated with cash flows is similar
Auction Valuation Method (M&A)

• Market of willing buyers and sellers meets in an exchange

• Transactions occur and are recorded
  – These transactions serve as basis for comparison of value
  – Could look to current stock markets for value indications as well

• Problem
  – “Winner’s Curse”
  – Deals do not generate targeted returns
  – MANY books/articles written about M&A success rates
Market Approach Issues

- Using market approach is fast, simple, and **WRONG**!
  - Price does not equal value
  - Rare/impossible to find proxy assets
    - Selling a business, not bushels of corn or cars
  - Transaction may represent a disparate income portfolio
  - Most market data based on history, not future
    - Do not drive car looking in rearview mirror
    - Look out the windshield
  - Remarkable survivorship biases
    - Typically looking only at successful deals, not failures
    - Functional equivalent of testing a drug, but ignoring fact that it kills 30% of the patients
Market Approach Issues

• Remarkable information asymmetry
  – Why did sale occur?
  – When did sale occur?
  – How many potential buyers knew about sale?
  – Was it a forced sale?
  – Was it a hostile transaction?
  – Was there a bidding war?
    • How many bidders?
    • How many bidders dropped out?
  – How long did the sale take to close?
  – What was the purported valuation standard?
  – What was the effect of the sale after the close
    • Accretive or destructive to value?
When “Market” Values IP

• We get valuation bubbles
  – “Dot com” bubble of late 1990’s
  – “Dot corn” ethanol boom in 2006
  – Solar bubble in 2009-2010
  – Electric vehicle bubble in 2008-2016
  – Social media bubbles (currently ongoing)

• We get Nortel valuation mistake
  – Patents sold for $4.5 billion out of bankruptcy

• Unfortunately, there are many examples to point to
Income Approach

• Most principled
• Based on business plan, market & operational inputs
  – Build revenues either top down or bottom-up
  – Bottom-up approach is more accountable, credible
Income Approach Mechanics

• Start with discounted cash flow (DCF) models
  – Express forecast future value in today’s dollars

• Highly dependent on several factors
  – Timing
  – Discount rate used (risk proxy)
  – Income taxes
    • Direct claim against value creation

• Typically account for uncertainty with:
  – Monte Carlo type simulations for specific drivers
  – Real options to model key decision points
    • This topic could be a multi-day seminar in itself
Drug Development Real Option Path

- Shows an entire real option pathway
  - Many different possible failure/exit points
  - Create value through option to abandon project
- Unreadable in this presentation
  - Intentional
  - This is complicated stuff
  - This is actually a simplified model too!
• Easier to read example

• Demonstrates odds and expected values at each option point
  – Measure odds with empirical observations

• Calculate value at each option point using traditional DCF methods
Income Approach Problems

- All valuation reduces to $+ - \times \div$
  - No matter the complexity, income valuation models are nothing but fancy calculators
  - It is easy to get the math wrong
- Improper valuation model construction
  - Does not capture reality well (e.g., “China” syndrome)
- Forecast uncertainty
  - Cannot predict future
- Forecaster bias/valuation model abuse
  - Who admits they have ugly babies?
    - Forecaster can force models to achieve particular result
- Improper risk estimation
- Result: Garbage in, garbage out
Valuation Challenges

• Improper valuation model construction
  – Does not capture reality well (e.g., “China” syndrome)

• Forecast uncertainty
  – Cannot predict future

• Forecaster bias
  – Is the valuation expert a dispassionate third party, or an advocate?

• Valuation model abuse
  – Who admits they have ugly babies?
  – Forecaster can force models to achieve particular outcome
    • However unrealistic the outcome

• Improper risk estimation
  – Discount rate is proxy for risk
Discount Rates

• Discount rates are an essential part of an income approach
• Technology-based discount rates should typically 30% or greater
  – Can establish using peer-reviewed discount rate model
• Do not look to public companies for discount rates
• Most tech companies have remarkably short holding periods
  – Five years is a long time
• High degree of failure in the industry
  – 75% or greater according to academic research
Example: Consider new Internet company

- Market rate for similar diversified publicly traded companies is 25.55%
- Historical success rate of similar companies is 20%
  - That is, a 1 in 5 shot it is successful
  - That is an optimistic statistic by the way
- 5-year holding period

Discount rate to use 73.23%
Income Approach Problems

• The value indication is “too high”
  – A valuation model is a complex calculator
• If the value is “too high”
  – Model itself is incorrect
  – Inputs are incorrect
• Model is incorrect
  – Ensure reasonable basis for business model (i.e., have others done something similar or are the economics compelling?)
• Drill into each input and test it
  – If each input is sound, then value is not “too high”
    • The math is immutable
Valuation Method Selection

• Generally use only one valuation method
  – Must capture incremental benefits measurement
    • Cannot do that, then valuation not possible
  – Must account for timing
  – Must account for proper risk consideration
  – Must account for additional attributes (e.g., rights to use, geographic restrictions, minimum license fees, etc.)

• Only income-based approach can account for all of these factors
  – Only method that respects monopolistic nature of IP
    • Cost and market approaches do not do this
  – Does not carry baggage of market approach
Testing Value Reasonableness
Testing Reasonableness

- Ideally, every valuation has a reasonableness test
  - Verifies that transaction makes fundamental economic sense
- Is it reasonable to pay 100 times earnings for an early stage company?
  - Paying $100 for current earnings of $1
  - Interesting question since many early stage companies lack earnings to begin with
  - Many early stage companies sell for remarkably large multiples
    - E.g. Apple offered $800 million for DropBox in 2009, Facebook buys Instagram for $1 billion in 2012, Yahoo buys Summly App for $30 million, Facebook buys WhatsApp for $19 billion
100 Times Earnings?

• Effective yield capitalization rate of 1%
  – Market multiple is inverse of discount rate
  – Suppose company discount rate is 20%
    • Compound annual growth must be 19% forever
  – Growth rate must be even higher for earlier-stage companies
    • Risks are greater, so growth rate must increase to compensate for greater discount rate

• Guaranteed to lock in losses as soon as you sign the check
  – Takes 16 years to generate nominal returns
  – Never recoup investment over time
100 Times Earnings?

![Graph showing the present value of total earnings over years. The graph indicates that the present value increases rapidly in the early years and then levels off before gradually decreasing. The x-axis represents the years (0 to 60), and the y-axis represents the present value of total earnings from $0.00 to $5.00.]
Analysis of Green Technologies
Green Technologies

• Thousands of green technologies emerge each year
• Fall into many broad buckets
  – E.g., food, wind power, solar power, waste recovery, electric vehicles, pollution controls, biofuels production
• Touch every major science area
  – Chemistry, software, electronics, semiconductors, business processes, etc.
About Green Technologies

• **Promise:**
  – Using ideas, better marshal scarce natural resources
  – Using ideas, reduce environmental impacts of human existence

• **Reality:**
  – Right or wrong, economic considerations usually prevail
  – Green technologies oftentimes require change of behavior
  – Green technologies are oftentimes much more expensive

• **Result:** Many green technologies are duds
  – Expensive research projects with few practical outputs
What Makes Technology Valuable?

• Certain common attributes make technologies valuable
  – Acute pain point technology solves
  – Marginal costs of alternatives are greater
  – Applies to a broad portion of the population
  – Does not depend on government intervention
  – Does not require significant change in human behavior

• Others exist as well to varying degrees of importance
Testing the Thesis

• Let’s test several green technologies and see how they stack up
  – Solar power
  – Electric vehicles
  – Living closer your job
  – Efficient way to sort auto fluff
Solar Power

• Acute pain point idea solves
  – **Fail:** Reliable, low-cost power exists for most consumers

• Marginal costs of alternatives are greater
  – **Fail:** Solar power is generally more expensive and requires decades to pay back

• Applies to a broad portion of the population
  – **Fail:** General population lacks space, money for solar panels

• Does not depend on government intervention
  – **Fail:** Few solar projects exist successfully without subsidies

• Does not require significant change in human behavior
  – **Fail:** Solar does not work at night, still need base load power
Electric Vehicles

• Acute pain point idea solves
  – Fail: People have many forms of reliable transportation already

• Marginal costs of alternatives are greater
  – Fail: Higher up-front costs, break-even is many years, if ever

• Applies to a broad portion of the population
  – Fail: In U.S., #1 and #3 selling vehicles are pickup trucks. EV sales concentrated in about 10 markets

• Does not depend on government intervention
  – Fail: Few EV projects exist without subsidies

• Does not require significant change in human behavior
  – Fail: Longer charging times, modifications to garages, inapplicability to many situations, range anxiety
Living Closer To Work

• Acute pain point idea solves
  – **Pass:** Reduced transportation costs, carbon footprint, commute times

• Marginal costs of alternatives are greater
  – **Pass:** Commutes are costly both in time and money

• Applies to a broad portion of the population
  – **Pass:** Anyone who works may find ways to live closer to work

• Does not depend on government intervention
  – **Pass:** Barring exceptional circumstances, few practical restrictions

• Does not require significant change in human behavior
  – **Maybe:** People may live far from work for quality of life issues
Efficient Way to Sort Auto Fluff

• Acute pain point idea solves
  – Pass: Recycle higher amounts of copper from shredded automobiles, generates revenues

• Marginal costs of alternatives are greater
  – Pass: Reduced landfill costs, manual labor sorting costs unviable

• Applies to a broad portion of the population
  – Pass: It works for all vehicles and even applies to landfills

• Does not depend on government intervention
  – Pass: Economic value is so great that companies invest without external economic incentives

• Does not require significant change in human behavior
  – Pass: Bolts on to existing equipment—auto shredders embraced idea
Test Results

• Solar power
  – Not scalable, valuable green idea
  – Empirical test: Many solar companies bankrupt/unprofitable

• Electric vehicles
  – Not scalable, valuable green idea
  – Empirical test: Many EV companies bankrupt/unprofitable

• Living closer to job
  – Scalable, non-valuable green idea
  – Empirical test: Few ways to profit from it directly, so not valuable

• Better way to sort auto fluff
  – Very scalable, very valuable green idea
  – Empirical test: Idea owner remarkably successful & wealthy
Analysis of Apple Economics
Apple’s revenue growth is absolutely remarkable and amazing
   – Adds equivalent of Fortune 500 company by revenue each year!
Yet financial performance is tapering out
   – Apple generated higher gross/incremental profit in 2012
## Simple iPhone Economics

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<th>Component</th>
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<th>iPhone 6 Plus 16GB</th>
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- Must also add in other costs for R&D, logistics, SGA, etc.
Simple iPhone Economics

- 2014 iPhone sales (millions): $101,991
- 2014 iPhone unit sales (thousands): 169,219
- Average revenue per phone: $602.71
- Cost range between $200.10 and $215.60
  - Average cost per phone of $207.85
- Average gross profit per phone of $394.86
  - That’s more than the retail price of many phones in the market!
Advanced iPhone Economics

• Margins are greater for Apple’s higher-end phones
  – Premium is $100 more for 64GB model
  – Premium is $200 more for 128GB model
  – Average part cost is $30-$60 depending on source
  – All hardware/software is otherwise identical
  – >70% gross profit

• Apple deliberately eliminated 32GB phone model
  – Pushes users into higher bracket or online iCloud storage
Advanced iPhone Economics

• Math is compelling
  – About 170 million iPhones sold in 2014
  – If 45% buy highest capacity phones (76.5 million phones)
  – Assume incremental profit of $140 per unit

• $10.7 billion in incremental profit
  – Attributable to packaging decision!
  – Amazingly, the consumer gushes to pay for it too!

• That’s about 20% of Apple’s profitability for 2014
  – What precisely is the technical innovation?
What Drives Revenues?

• Is it hardware innovation?
  – Apple phones oftentimes lag the market for hardware
    • Near-field communication, display resolution, display technology (e.g., Galaxy S6 Edge), wireless charging, performance (Galaxy S6 faster than iPhone 6 on Geekbench 3), etc.
  – Apple’s main advantage is apps perception
    • Does that really drive revenues?
      • Android has more apps (2.8 million) in its store versus Apple (2.2 million)
• Or is it brand/momentum?
  – Brands and momentum encourage people to spend money disproportionately to intrinsic value received because of perception
Market Momentum

• Momentum can have remarkable explanatory power for consumer products
  – Especially for those with strong brands
  – Importantly, momentum does not always equate with best of breed

• Momentum on Apple’s primary consumer electronics products tells compelling story
iPod Unit Sales

iPod Sales by Year

Units Sold

Year


y = -962929x^2 + 4E+09x - 4E+12
R^2 = 0.9978

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Questions?