Entrepreneurial finance

- Today, entrepreneurship is most often described as the research of opportunities to combine and redistribute resources, without regard to current ownership or control of those resources

- Innovation is very important but is not enough to guarantee a reward for the entrepreneur. To be successful, an entrepreneur needs to maintain a clear focus on how strategic choices and implementation decisions are likely to affect rewards

- “Good ideas and good products are a dime a dozen. Good execution and good management – in a word, good people – are rare” (Rock, 1992)

Entrepreneurship is Multidimensional

- The entrepreneur must:
  - perceive an opportunity to create value by redeploying society's resources
  - devise a strategy for marshaling control of necessary resources
  - implement a plan of action to cause the change
  - harvest the rewards that accrue from the innovation

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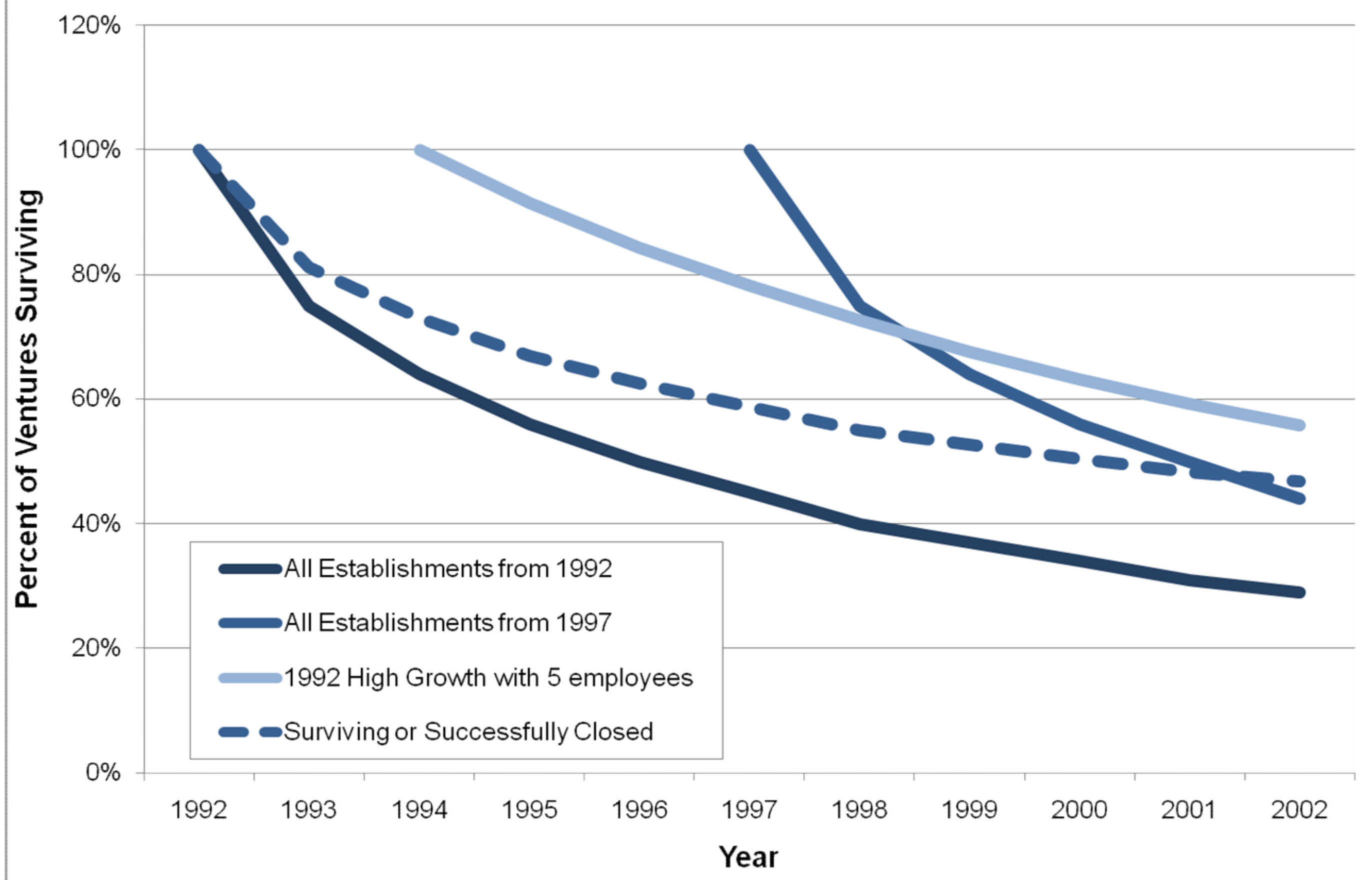
New venture survival rates

High growth = At least a 50% increase in employees from 1992 to 1993



Source: "Small Business Growth: Searching for Stylized Facts," Small Business Administration Working Paper, 2007, prepared by Brian Headd and Bruce Kirchhoff

New venture survival rates

- 50% of new ventures survive at least four years and 30% at least ten years
- “High growth” firms have a better survival record; 72% survive at least four years
- One-third of non-surviving entrepreneurs still considered their venture a success
- From 2000 to 2007 an average of 904.900 new business were created per year in the US. The average number of business terminations during the same period was 744.100 (around 83%)
- The number terminated with a financial loss to creditors via bankruptcy, however, is only 4,5% of all terminations

Economic downturns and entrepreneurship

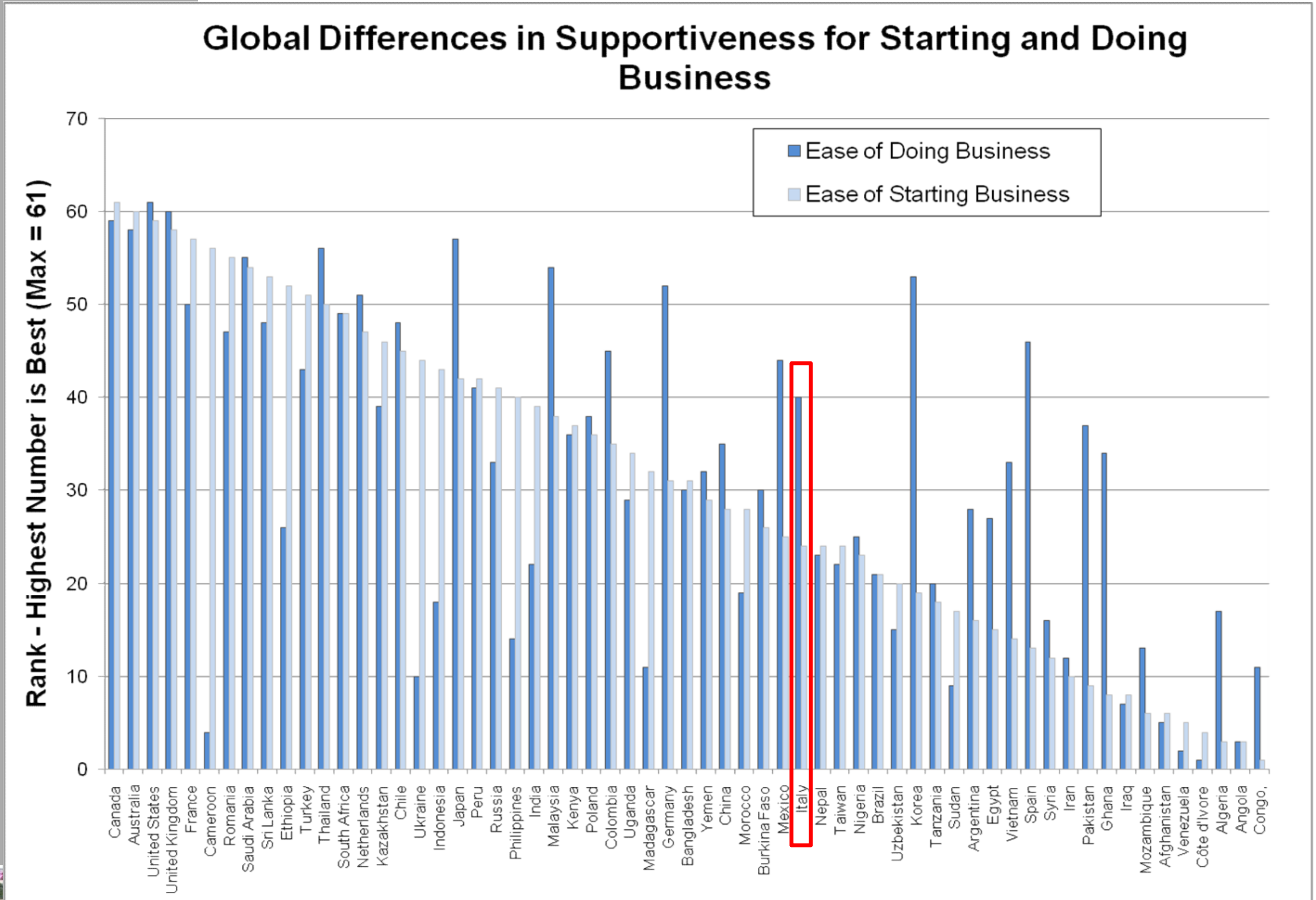
- Benefits of starting a venture in a downturn
  - lower opportunity cost
  - competition is less intense
  - easy to hire high quality employees
- Famous companies started during economic downturns

SOUTHWEST AIRLINES, hp, Genentech IN BUSINESS FOR LIFE, FedEx, Microsoft®

- Financing can be scarce because the supply of capital to the markets is low

Globalization of entrepreneurship

- Entrepreneurship now comes from all over the world and is driven by
  - increased competition for ideas and for financing
  - technological advances: communications and computers
  - government policies and subsidies


Global Differences in Supportiveness for Starting and Doing Business
Rank - Highest Number is Best (Max = 61)
Ease of Doing Business
Ease of Starting Business
0
10
20
30
40
50
60
70
Canada
Australia
United States
United Kingdom
France
Cameroon
Romania
Saudi Arabia
Sri Lanka
Ethiopia
Turkey
Thailand
South Africa
Netherlands
Kazakhstan
Chile
Ukraine
Indonesia
Japan
Peru
Russia
Philippines
India
Malaysia
Kenya
Poland
Colombia
Uganda
Madagascar
Germany
Bangladesh
Yemen
China
Morocco
Burkina Faso
Mexico
Italy
Nepal
Taiwan
Nigeria
Brazil
Uzbekistan
Korea
Tanzania
Sudan
Argentina
Egypt
Vietnam
Spain
Syria
Iran
Pakistan
Ghana
Iraq
Mozambique
Afghanistan
Venezuela
Côte d'Ivore
Algeria
Angola
Congo,

Types of entrepreneurship

- Replicative versus innovative
- Opportunity-based versus necessity-based
- Corporate Venturing
- Social Venturing

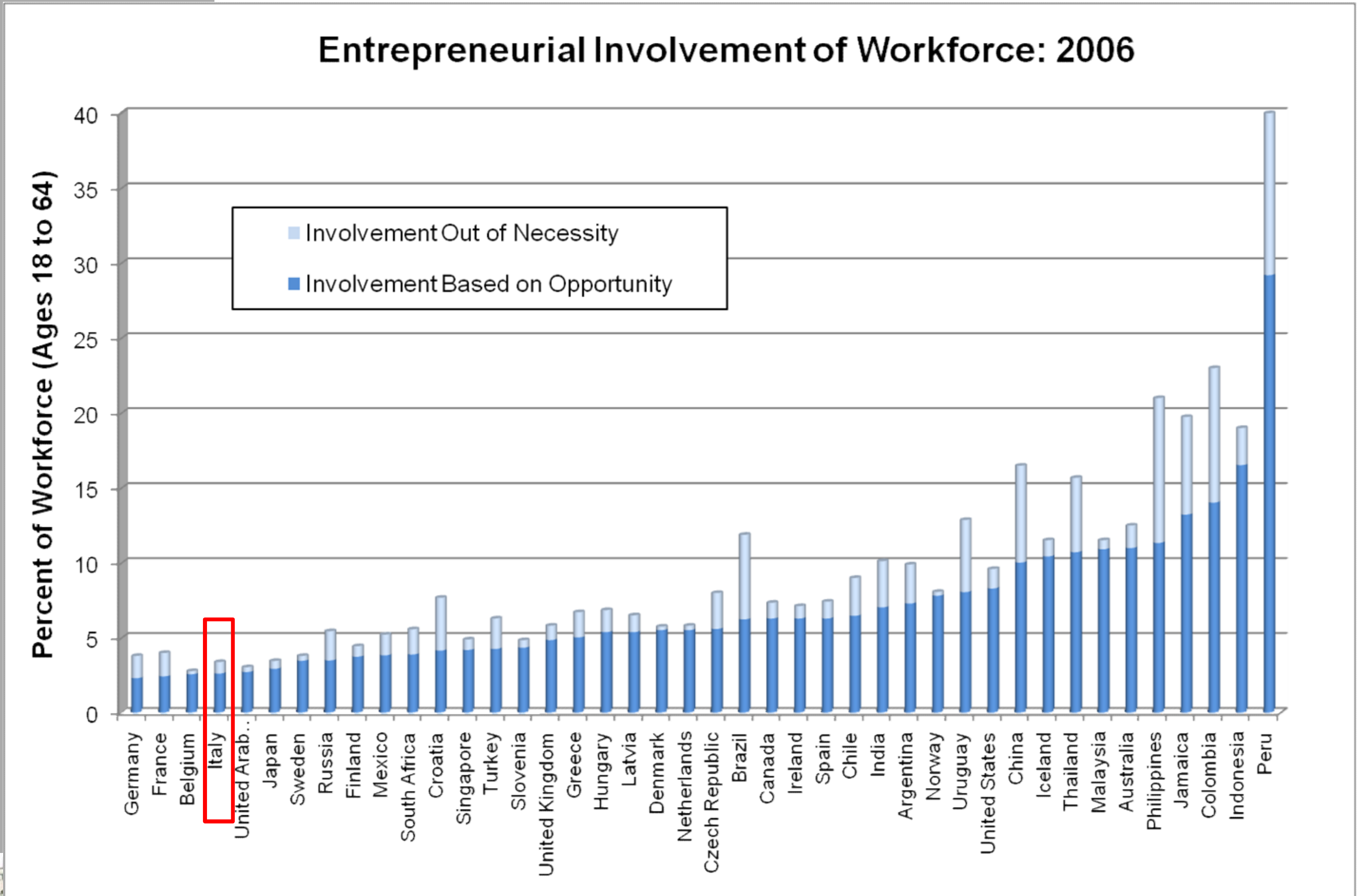
Replicative vs. innovative entrepreneur

- Replicative entrepreneurs function as efficient coordinators of resources
  - start and maintain businesses that mimic predecessors
  - provide more of existing goods and services
  - e.g. grocery stores, home improvement stores, dry cleaners,…
- Innovative entrepreneurship reshapes industries and has the potential to add huge value to economies
  - e.g. Google, Intel, Facebook, and e-Bay

Necessity-based vs. opportunity-based entrepreneurship

- Necessity-based entrepreneurs start businesses due to a lack of alternatives
  - small, low-capital ventures
  - almost always replicative
  - common in emerging economies

- Opportunity-based entrepreneurs are motivated by the idea
  - accounts for virtually all innovative entrepreneurship
  - most frequently found in developed economies


Entrepreneurial Involvement of Workforce: 2006
Percent of Workforce (Ages 18 to 64)
0
5
10
15
20
25
30
35
40
Involvement Out of Necessity
Involvement Based on Opportunity
Germany
France
Belgium
Italy
United Arab…
Japan
Sweden
Russia
Finland
Mexico
South Africa
Croatia
Singapore
Turkey
Slovenia
United Kingdom
Greece
Hungary
Latvia
Denmark
Netherlands
Czech Republic
Brazil
Canada
Ireland
Spain
Chile
India
Argentina
Norway
Uruguay
United States
China
Iceland
Thailand
Malaysia
Australia
Philippines
Jamaica
Colombia
Indonesia
Peru

Corporate Venturing

- Corporate venturing is common for projects requiring
  - large and complex research teams
  - generic testing equipment
  - lengthy development times

- Incentives to encourage entrepreneurship are difficult to implement in large organizations
  - motivating people to work on the right projects
  - rewarding success
  - perceived inequities

Social Venturing

- Social venturing involves entrepreneurial efforts where financial returns are traded off against social objectives
- Primary objective of the venture's product or service is to address a social issue
- Financial returns are traded off against social objectives
- Includes efforts by non-profit entities to create for-profit subsidiaries, e.g. museum shops
- Recent trend in "green-tech" or "clean-tech"

The finance paradigm

- The guidelines of financial decision making can be stated as:
  - More of a good is preferred to less
  - Present wealth is preferred to future wealth
  - Safe assets are preferred to risky assets

- The type of decisions:
  - Investment decisions
    - Concern acquisition or sale of assets (tangible or intangible) that are expected to have a worth higher than their cost
  - Financing decisions
    - Concern the mixture of resources used to finance investment decisions

Entrepreneurial and corporate finance

- The eight most important differences between corporate and entrepreneurial finance are:
  - The non-separability of investment decisions and financing decisions
  - The role of diversification of risk as a determinant of investment value
  - The extent of managerial involvement by outside investors
  - The effects of information problems on the firm's ability to undertake a project
  - The role of contracting to resolve incentive problems
  - The importance of options as determinants of value
  - The importance of realize the returns when a liquidity event occurs, as an aspect of valuation and of investment decision
  - The focus on maximizing value for the entrepreneur as distinct from maximizing value for shareholders

The effects of information problems on the firm's ability to undertake a project

- Public corporations generally can make investment decisions without much immediate regards to how outside investors perceive the value of the investment. Most corporate projects are small relative to the overall value of the corporation
- In the case of a start-up, outside investors are looking specifically to the venture to realize a return. If they don't trust in the project, it will not go forward

The role of contracting to resolve incentive problems

- Contract terms are designed to motivate entrepreneurs to develop their ideas quickly, to guarantee that they stop spending resources on an idea after its potential is found to be unacceptable, and to make certain that ineffective management does not cause the venture to fail
- Staging of investments, termination options, and other contractual devices transfer substantial control over ultimate success to the outside investors
- From the perspective of the entrepreneur, it is important to ensure that the incentives of investors to stop investing or to make other changes are compatible with the entrepreneur's interests

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Remember

- A new venture should not be undertaken unless the expected reward is high enough to compensate for the value of other foregone opportunities
- The knowledge of finance and cash management is one of the most important area of knowledge for an entrepreneur to have
- It is a rare individual who is good at both seeing an opportunity to add value through innovation and managing the venture that is intended to capitalize the opportunity

The Importance of real options

- A real option is a right, but not an obligation, to undertake a decision about a non-financial (i.e., 'real') asset
- Examples: abandon a poorly performing venture or expand a venture doing well
- Values of real options depend importantly on the degree of uncertainty surrounding the investment
- Because new ventures are started under conditions of great uncertainty, real options often are very important to the decision to engage in an entrepreneurial venture

Objective: Maximizing value for the entrepreneur

- Corporate managers often focus on maximizing shareholder value
- We focus decision making on maximizing the value for the entrepreneur
- May be different from maximizing the value of the venture
- All investors may benefit from knowing the entrepreneur’s objective
- The real option structure and financing structure are interdependent. Thus, the entrepreneur needs to search for the most valuable financing structure to complement a particular real option structure

Stages of new venture development

Stages of New Venture Development

Stages	**Opportunity** →	**Research and Development** →	**Start-up** →	**Early Growth** →	**Rapid Growth** →	**Exit**
Actions	Obtain Seed Financing Assess Opportunity Assess Strategic Alternatives Determine Organizational Structure Determine Organizational Form Prepare Business Plan	Obtain R&D Financing Build Research Team Conduct R&D Activities, e.g.: Secure Patent Develop Prototype Build Website Test Market/Market Research Assess/Update Business Plan	Obtain Start-up Financing Acquire Facilities and Equipment Initiate Production Build Starting Inventory Build Sales and Marketing Team Initiate Revenue Generation Assess/Update Business Plan	Obtain Early-Growth Financing Work Toward Breakeven Expand Team as Needed Expand Facilities as Needed Assess/Update Business Plan	Obtain Rapid-Growth Financing Work Toward Proven Viability Expand Team as Needed Expand Facilities as Needed Build Track Record for Harvest Assess/Update Business Plan	Obtain Continuing Financing: IPO Acquisition Buy-Out Early Investors Harvest Assess/Update Business Plan
Real Options	Continue to Next Stage Modify Concept Abandon	Continue to Next Stage Extend Stage/Financing Modify R&D Strategy Abandon	Continue to Next Stage Modify Production/Financing Modify Marketing/Financing Abandon	Continue to Next Stage Extend Stage/Financing Abandon	Continue to Next Stage Extend Stage/Financing	Choose Form of Exit
Description	All activities through preparation of business plan and before incurring significant expense.	All research and development activity that must be completed before revenue generation can commence.	All activities related to start of production and marketing and initiation of revenue-generating activities.	All activities during the period before the venture reaches a level of sales sufficient for cash-flow breakeven.	All activities during the period after break-even and before sustainable viability is established.	All activities related to establishing continuing financing and enabling early investors to harvest.

The figure represents a high-tech, single-product venture for a product that gains rapid market acceptance after being introduced

Measuring progress with milestones

- Enable the parties to postpone financial commitments until needed
- Function as a working hypotheses
- Milestones provide ways to enhance the expected benefits of the project by structuring opportunities to adapt to new information
- Critical in determining if and how the venture should continue
- Understanding the reasons for failing to meet a milestone is important

Some common milestones

- The following are some examples of milestones suggested by Block and MacMillan (1985):
  - **Completion of concept and product testing**
    - Is there a real market opportunity?
    - What is the market?
    - How should the product be priced, distributed,…?
  - **Completion of a prototype**
    - Can the product be manufactured?
    - What facilities are needed?
    - How costly is manufacturing?
    - How long does production require?
  - **First financing**
    - Can enough money be raised to carry the venture to the next milestone?
    - Can we convince others of the value of our project?
  - **Completion of initial plant tests**
    - What materials are best suited to the product?
    - What training is needed?

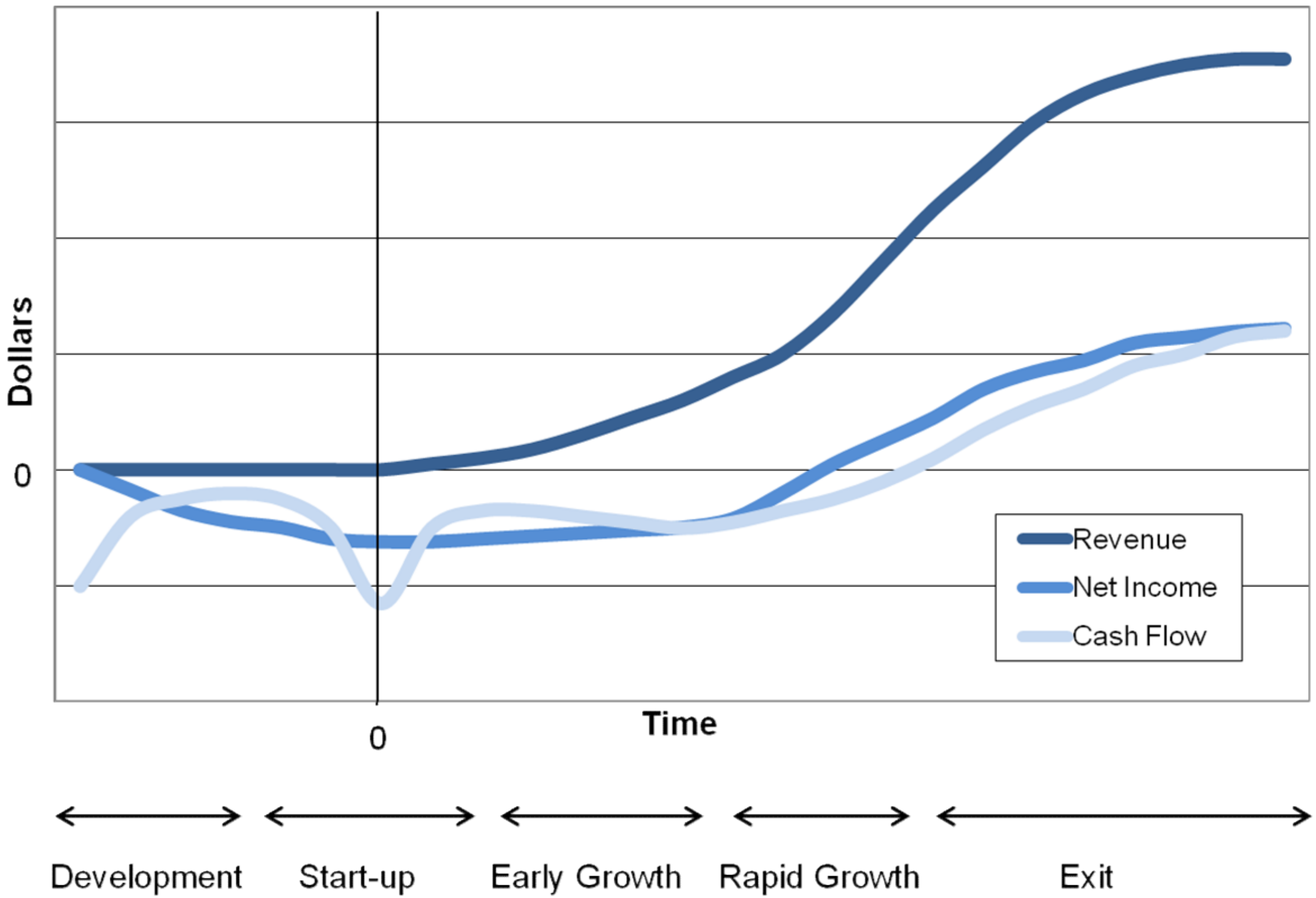
Some common milestones

- Some examples of milestones - Block and MacMillan (1985):
  - **Marketing testing**
    - Will customers buy the product?
    - Are the early assumptions about the opportunity still supported?
    - What level of sales can be achieved?
  - **Production start-up**
    - Are operations working as expected?
    - How can the manufacturing process be fine-tuned?
  - **Bellwether sale**
    - What can be learned from the first important sale about how best to manufacture, distribute, and market the product?
  - **First competitive reaction**
    - How are competitors reacting?
    - Is the reaction different from anticipated?
  - **First redesign or redirection**
    - In the event of such a change, has the market responded to the change in the way that was expected? If not, why not?

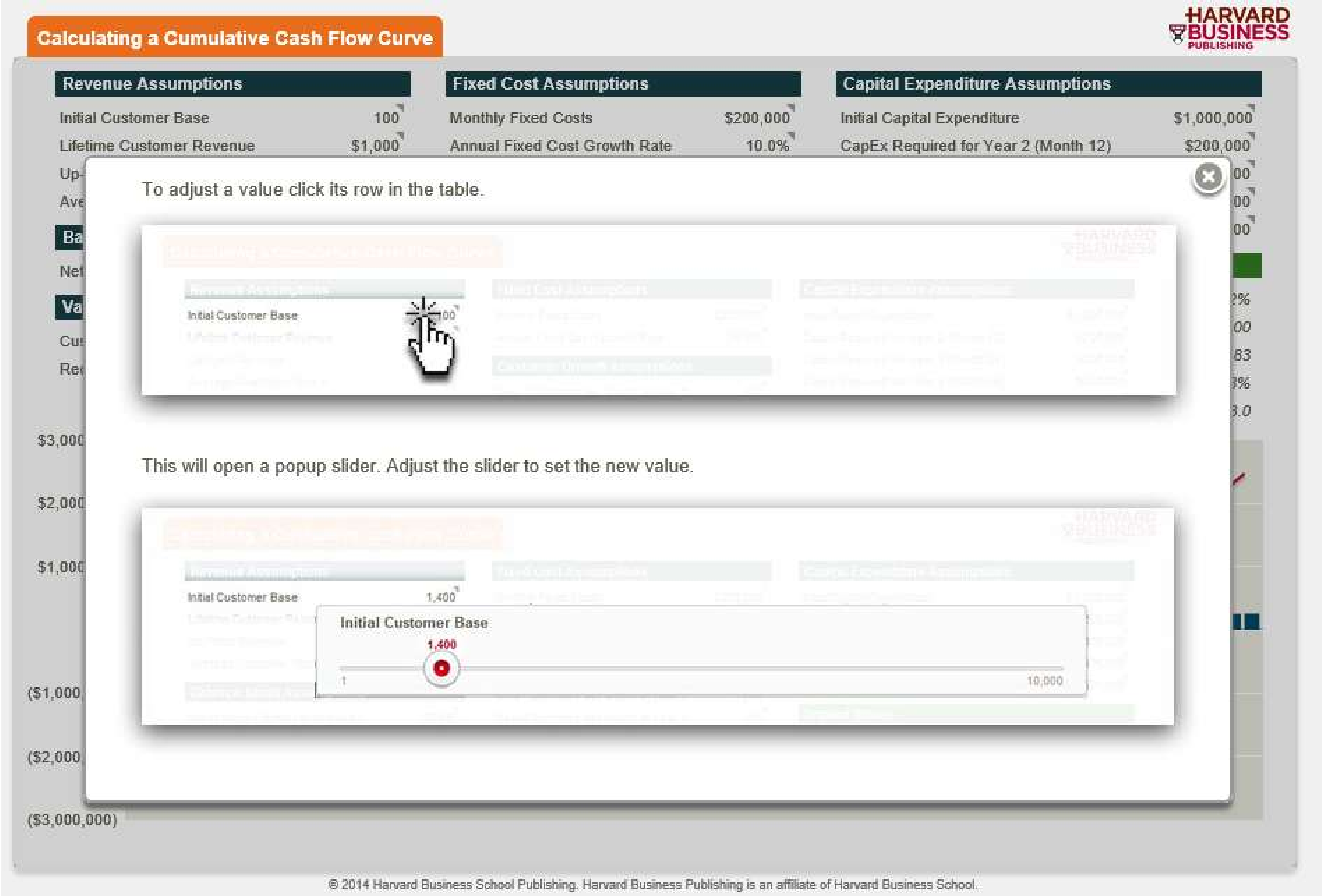
Financial performance and the stages of new venture development

- Development
- Start-up
- Early-growth
- Rapid-growth
- Exit

Financial Performance and Stages of New Venture Development



Calculating a Cumulative Cash Flow Curve



The sequence of new venture financing

- Bootstrapping
  - i.e.: drawing down saving accounts, taking out second mortgage, using the credit lines of multiple credit cards, borrowing on life insurance policies
- Seed financing
  - It consist of relatively small amounts of money to support exploration of a concept. The principal risk exposure of seed financing is risk of discovery
- R&D financing
  - In cases where R&D efforts are expensive and protracted, R&D financing could be required beyond what is typically regarded as seed financing, The critical risk exposure in such cases is that development efforts fail
- Start-up financing
  - It covers activities from later R&D to initiation of sales. At this point, actual production has not yet begun, and the main risk exposure is related to whether a cost-effective manufacturing technology can be put in place
- Later stage financing is associated with the early-growth and rapid-growth stages of development

The sequence of new venture financing

- Later stage financing:
  - First-stage financing
  - Second-stage financing
  - Third-stage financing

- Later stage financing can be divided in two general type of financing:

  1. *Financing provided to a company that has initiated production and is generating revenues but (normally) has not yet achieved profitability*. The critical element of risk is marketing risk – the question whether the venture can reach a level of sales sufficient to attract and compensate investors in an exit

  2. *Financing to support the continuing growth of a venture that is operating around the breakeven point of profitability*. The company is not yet generating sufficient cash flow to support planned expansion. Uncertainty remains about ultimate market potential and profitability

The sequence of new venture financing

- Mezzanine financing
  - It supports major expansion of a profitable business. Because of continuing marjket uncertainty and the possible actions of competitors, the debt typically is high risk
- Bridge financing
  - It is temporary financing, particularly between later-stage financing rounds and harvesting. Can be used to allows the firm time to arrange permanent financing or to facilitate a LBO or a MBO of the business

The new venture business plan

- Presents the conclusions of the strategic planning exercise, i.e., the strategic planning comes first

- Writing and circulating a business plan too early can be a costly mistake, even if the entrepreneur eventually is able to attract funding

- Fundamentally, the plan is the logical implication of a set of hypotheses about a perceived opportunity in terms of what is expected to result if the opportunity is pursued in a particular way

- The plan reflect expectations about such factors as when product development effort will be completed, when the product will be ready to market, product cost and unit price, and rate of sales growth

The new venture business plan

- As the venture progresses, these hypotheses are tested. Failure to achieve a milestone or financial projection would signal the need to reexamine expectations and reevaluate the merits of the venture

- It is easier to attract investors with a business plan that sets out explicit financial projections and milestones than with a plan that is vague

- A plan that is specific inspires more confidence among potential investors and makes contracting easier

- Different than for an established business
  - uncertainty about assumptions
  - milestones and real options
  - used for raising capital

Overview of the business plan

- Focus on the purposes and uses of the plan
- Identify and support key assumptions
- Highlight critical factors for success or failure
- Delineate milestones so users can evaluate success
- Include financial projections to test the plan, commit the entrepreneur, and facilitate negotiation
- For a new venture, use of business plan for performance evaluation and management compensation is not a good idea

Outline of a typical business plan

Executive Summary

I. Background and purpose of venture

II. Market analysis

III. Products and services

IV. Development, production, and operations

V. Organization and management

VI. Ownership and control

VII. Financial information

What makes a business plan convincing?

- Credible evidence of the entrepreneur's commitment and beliefs about the validity of projections presented in the business plan is critical to securing funding
- Demonstrate understanding of the technology, market, risks, and customer needs
- Defensible assumptions that yield testable hypotheses
- Credible evidence of irrevocable commitment
  - i.e. The loss of salary that comes with resignation of current employment is credible as a signal only if the entrepreneur would have difficulty finding new employment of equal value
- Evidence of reputation and certification
  - Others' reputation can be as a substitute for the first time entrepreneur's reputation
- Signals the quality and capabilities of the team

Some pitfalls to avoid in the business plan

LBS professor John Mullins identifies five "deal killers" that entrepreneurs should avoid in the business plan:

1. Failing to identify clearly the customer problem that the venture would address
2. Failing to identify clearly a narrow target market
3. Relying on a business model that does not make economic sense
4. Relying on a highly credentialed team that lacks the critical expertise the venture needs
5. Failing to recognize the threats and potential problems

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Chapter 2

NEW VENTURE FINANCING CONSIDERATIONS AND CHOICES

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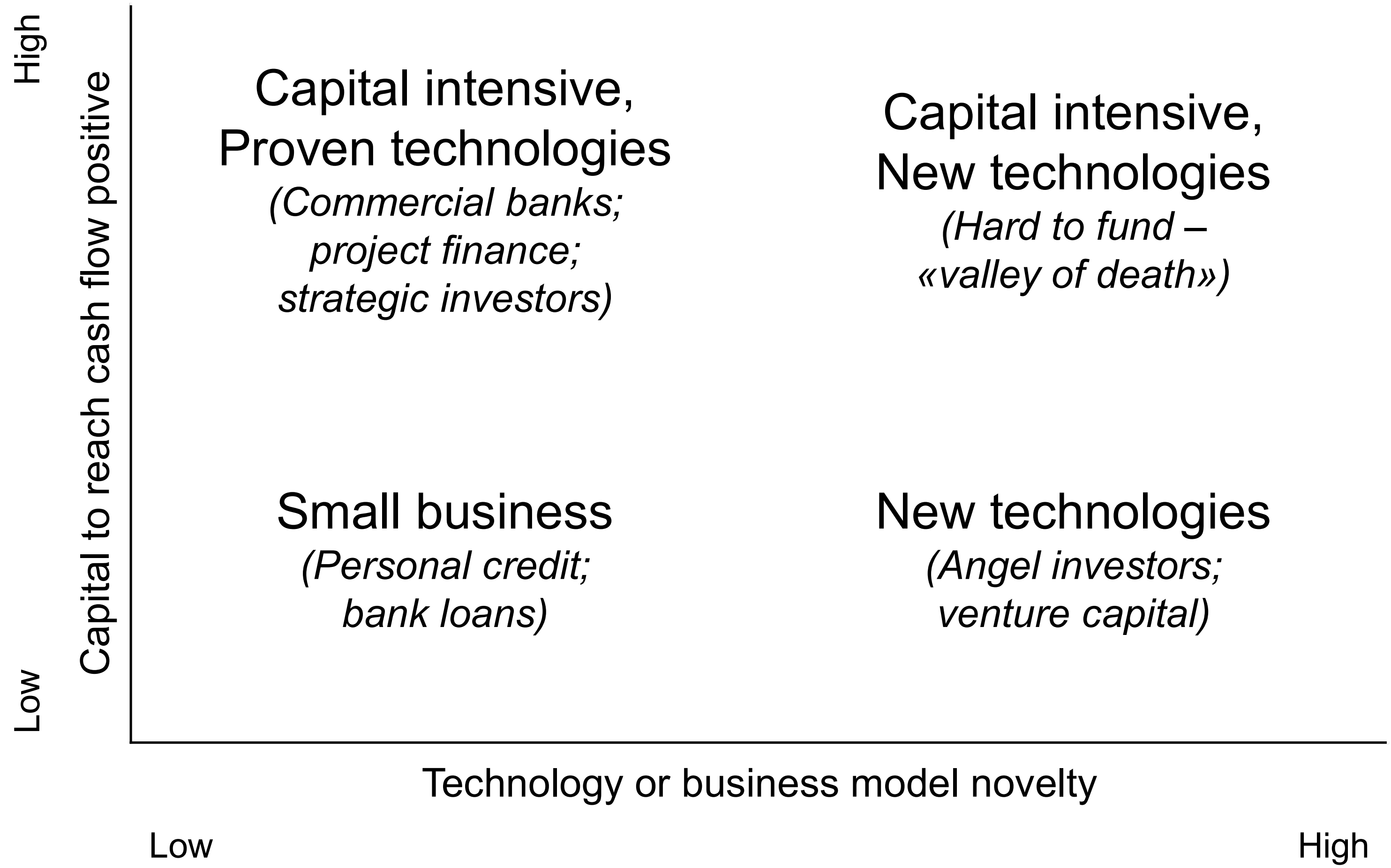
Sources of new venture financing

	R&D	Start-up	Early Growth	Rapid Growth	Exit
Entrepreneur					
Friends and Family					
Angel Investors					
Corporate Strategic Partner					
Venture Capital					
Asset-Based Lender					
Venture Leasing					
Government Programs					
Trade Credit/Vendor Financing					
Factoring					
Franchising					
Commercial Bank Lending					
Mezzanine Lender					
Public Debt					
IPO					
Acquisition, LBO, MBO					

Entrepreneurial finance framework



Fonte: Kerr W., Nanda R., Financing New Ventures, HBS, 2011

Sources of new venture financing: bootstrap financing

- Financing that does not depend on investor assessment of the merits of the opportunity or assets of the venture
- May be from entrepreneur's own resources or from friends and family
  - personal savings (90%)
  - credit card/personal loans (28%)
  - loans from family and friends (7%)
  - equity investment from family and friends (5%)
- Family and friends generally have years of experience with the entrepreneur. Often, they are incapable of assessing the merits of the opportunity and are investing because they believe in the entrepreneur or feel compelled by family relationships

Sources of new venture financing: angel investors

- Individual freelance investors (high-net-worth individuals) who are usually interested in investing fairly small amounts of money ($25,000 - $500,000) in early-stage ventures
- Willing to invest over long horizons (5 – 10 years)
- Evolved to a quasi-institutional form with angels acting as groups and may co-invest
- Often bring significant industry experience and are interested in active involvement

Sources of new venture financing: Venture capital

- Venture capital (VC) funds are organized as limited partnerships
  - Limited partners (LPs) provide most of the capital
  - General partner (GP) is responsible for managing the fund, including investment selection, working with entrepreneurs, and harvesting the investments
- Focused on equity investment in high-risk ventures with large potential return
- The venture must be developed to a point where the venture capitalist can expect to add value, not just money
- The venture capitalist selects the ventures in which the fund invests, monitors the progress of portfolio companies, sits on boards of directors, and metes out infusions of financing based on attainment of milestones
- The investment agreement gives the fund the right to force a liquidity event to realize returns

Sources of new venture financing: asset-based lenders

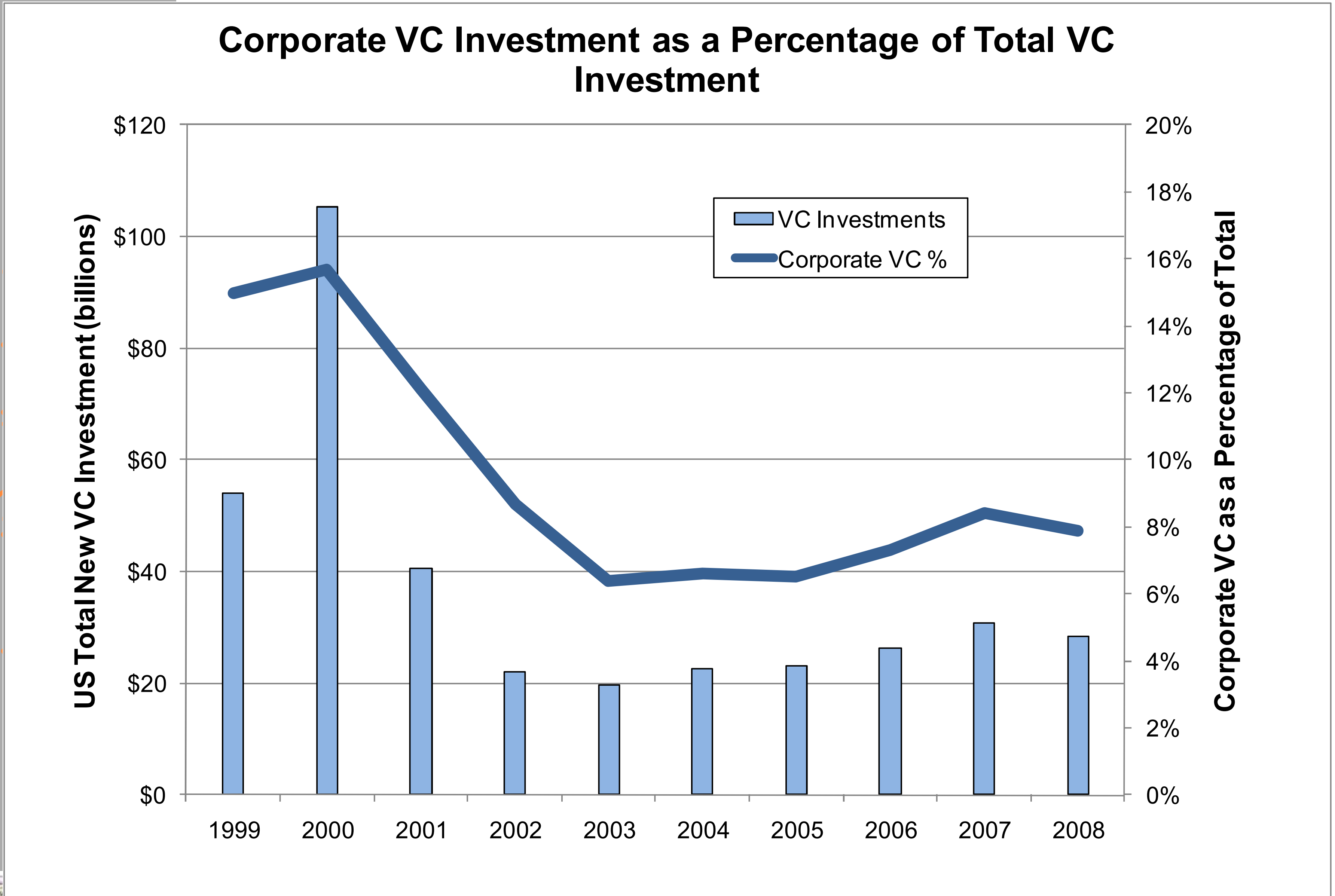
- Asset-based lenders, or “secured lenders,” provide debt capital to businesses that have assets that can serve as collateral
  - Rely on the ability to liquidate business assets for debt servicing if necessary (rather than cash flow)
  - Loans may be secured by accounts receivable, inventory, equipment, real estate, or other assets with verifiable market/liquidation values
  - Estimated at $590 billion in 2008 in the United States

Sources of new venture financing: venture leasing

- An entrepreneur who requires tangible assets can lease, rather than purchase them
- Usually involves assets that are key to the operation of the venture
- The lessor's return may be tied to the financial performance of the venture: if the venture does well the lessor realizes more than the expected return, and conversely
- Tax advantages to leasing as compared to owning

Sources of new venture financing: corporate venturing

- Can be internally or externally managed
  - Internally managed venture investing
    - Can help to retain creative employees
    - More likely to occur in firms that depend on innovation to sustain competitive advantage
    - Attempts to keep good ideas from “escaping”
    - Example: Any Alcatel-Lucent employee can come to the group to pitch an idea. If the idea makes the grade, the group can provide up to $100.000 of seed capital to fund work on a business plan, Larger amounts of funding are available to bring the product or idea closer to market. The researcher receives shares in the new venture while continuing to draw a salary from Alcatel
  - Externally managed venture investing
    - may seek only financial returns or strategic investments


Corporate VC Investment as a Percentage of Total VC Investment
$120
$100
$80
$60
$40
$20
$0
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
VC Investments
Corporate VC %
US Total New VC Investment (billions)
Corporate VC as a Percentage of Total
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008

Sources of new venture financing: government programs

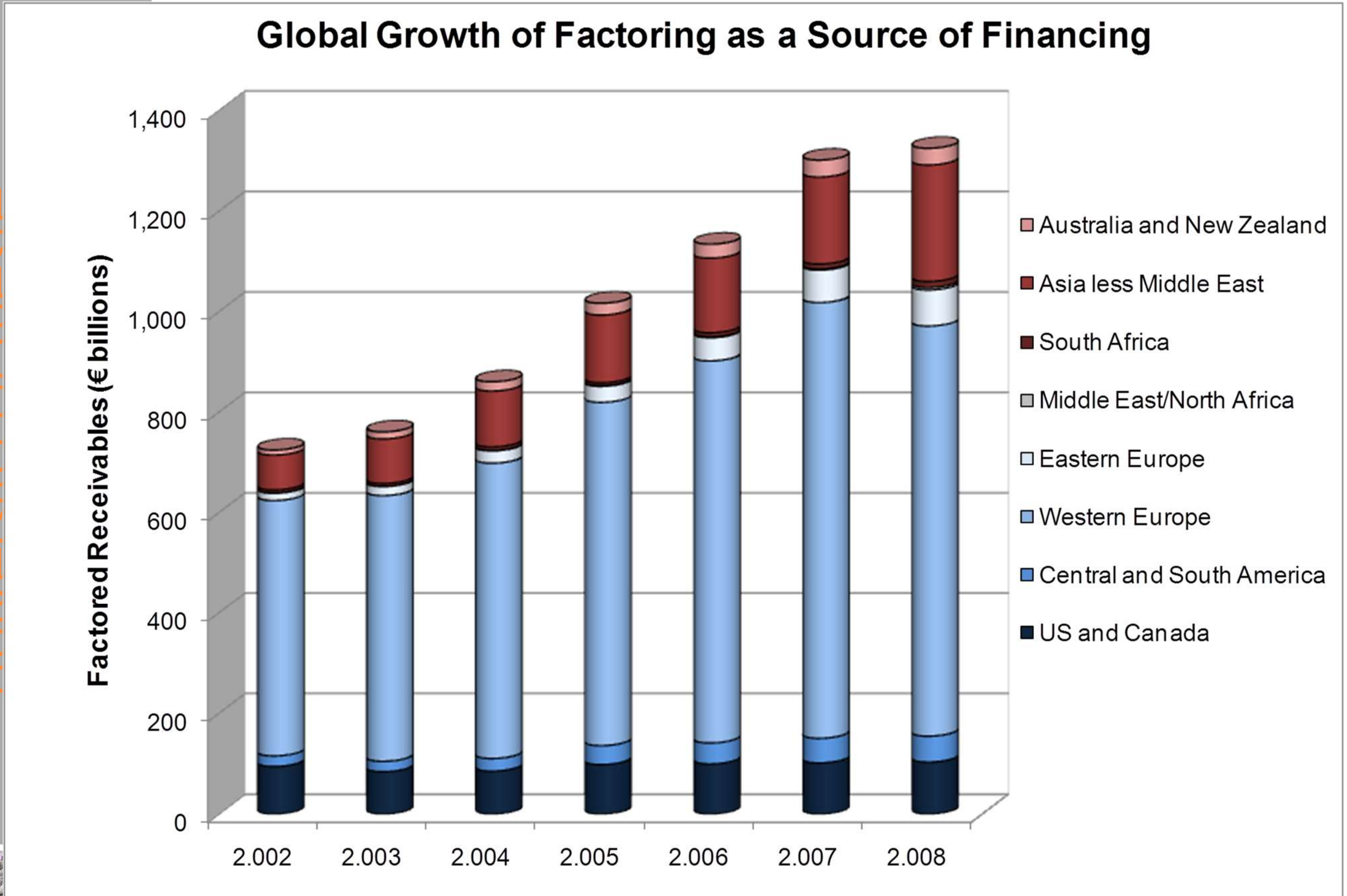
- Many countries have established agencies to support small business formation and growth
- The US Small Business Administration (SBA) funds entrepreneurship via
  - loan guarantee programs
  - Small Business Investment Companies (SBIC)
  - Small Business Innovation Research Program (SBIR)

Sources of new venture financing: trade credit

- Trade credit, or vendor financing arises whenever a business makes a purchase from a supplier that offers payment terms
- Terms are usually industry-specific
- Largest source of external short-term financing for firms; more important in emerging economies, where risk capital is often scarce
- Net trade credit (A/P – A/R) defines the position of the firm in terms of whether trade credit functions as a net source or a net use of funds
- Trade credit can be very expensive. For example, the implicit interest rate for terms 2/10 net 30 is near 44% (using compounded interest rate)

Sources of new venture financing: factoring

- A factor buys accounts receivable of the venture and manages the collection activities
- Factoring comes in two basic types
  - with recourse (if the customer does not pay, the factor can collect from the venture directly)
  - without recourse (in case a customer of the venture doesn't pay its bill, the factor absorbs the loss)
- Basic elements of a factoring transaction
  - advance: 70 to 90% of face value of receivables
  - reserve: a portion held back if with recourse
  - fees: 2 to 6% for handling, lending, and risk
  - explicit interest rate



Global Growth of Factoring as a Source of Financing
Factored Receivables (€ billions)
1,400
1,200
1,000
800
600
400
200
0
2.002
2.003
2.004
2.005
2.006
2.007
2.008
Australia and New Zealand
Asia less Middle East
South Africa
Middle East/North Africa
Eastern Europe
Western Europe
Central and South America
US and Canada

Sources of new venture financing: franchising

- Franchising can enable a business concept to grow rapidly by using capital from franchisees
- Franchisor establishes a business format and offers franchising opportunities to prospective franchisees
- Franchisor provide a range of services: site selection, training, product supply, marketing and assistance
- Franchisee normally pays a franchise fee and makes periodic payments that are partly based on revenues
- Examples:

Sources of new venture financing: mezzanine capital

- Capital raised after the firm has established a record of positive net income with revenues approaching $10 million or more
  - subordinated debt or preferred equity
  - a hybrid of senior debt and common equity "sweeteners"
  - often provided by some VC firms or other private equity funds

Sources of new venture financing: debt

- Pros
  - interest is tax deductible
  - debt is usually less expensive than equity
  - no loss of control

- Cons
  - cash flow required for interest and principal payments
  - senior to equity and has contractual rights in the case of financial distress

Sources of new venture financing: private placements

- Both equity and debt can be issued via "private placement"
- Prospective equity investors or lenders are identified by the company's management team, the VC, or an investment bank
- Benefits
  - can be faster and less expensive than a public offering
  - higher flexibility (complex security arrangements)
  - limits disclosure of strategic information
  - facilitates monitoring

Sources of new venture financing: initial public offering (IPO)

- First sale of equity to public investors
- IPOs provide a very small fraction of overall new venture funding
- Provides exit for VCs and other investors in high-risk, high-growth ventures
- Company raises capital by selling registered equity shares to the public via a formal offering process

Sources of new venture financing: initial public offering (IPO)

- Pros
  - establishes outside market for the venture's shares
    - investor feedback on managerial decisions
    - can be used as a basis for negotiating merger and acquisition transactions
    - employee stock incentives
  - large amounts of capital can be raised

- Cons
  - relatively expensive
  - disclosure requirements
  - focus on short-term earnings

Sources of new venture financing: direct public offering

- Fall between private and public offering
- Firm issues equity to small numbers of "sophisticated" investors
- No formal public offering process
- Shares may eventually become freely tradable

Considerations when choosing financing

- Are not-for-profit status and the attendant tax exemption worthwhile?
- Should liability be limited, or should losses be passed on to the company's owners?
- Is it important to be able to switch corporate forms easily as the company evolves?
- How important is it to avoid corporate-style taxation (i.e., double taxation)?
- Who are the best monitors of the firm-owners, investors, or managers?
- How will the monitors be monitored?

The "deal"

- The deal defines the allocation of risk and return and the rights and obligations of the entrepreneur and the investor
- Attempts to resolve information problems
- Starts with a term sheet which becomes the basis for the investment agreement
- Describes milestones and staging
- A well-structure deal can create value for both the entrepreneur and the investor

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Information problems facing the entrepreneur and investors

- Three basic information problems
  - Information about the value of the opportunity may be incomplete and uncertain
  - Information about the value of the idea and the ability of the entrepreneur is held asymmetrically
    - The entrepreneur probably knows more about her/his own abilities and commitment than does an outsider
  - Risk of appropriation of intellectual property

Term sheet

The term sheet reflects an agreed-upon valuation and sets out the amount of investment that is to be made, as well as ownership claims the investor will receive

It may identify some of the options, rights, and responsibilities of each party

A term sheet may reflect mutual understandings and expectations, but it rarely constitutes a binding agreement on the terms of the investment

It is just a step on the path to an investment agreement

It does not commit either party to the deal

Pre-money and post-money valuation

- Pre-money valuation is the implied value of the venture prior to new investment
- Post-money is the total value of the venture after the new investment
- It is important to recognize that the ultimate concern of the entrepreneur is not the post money valuation but the true value to the entrepreneur of the entrepreneur's ownership interest
- Many entrepreneurs make the mistake of focusing on the post money valuation and ignore the value of the sweeteners and other rights that were promised to the investor

Pre-money and post-money valuation

Example:

Prior to raising capital, a venture has 100.000 exiting shares. A new investor will invest \$150.000 and get 20.000 shares. What are the pre- and post-money valuations?

Implied share price = \$150.000 ÷ 20.000 shares = \$7,50

Pre-money valuation = 100.000 shares x \$7,50 = \$750.000

Post-money valuation = \$750.000 + \$150.000 = \$900.000

Investment agreements

- The investment agreement is a contract between the entrepreneur and the investor
- With the term sheet as a starting point, the investment agreement formally sets out the terms and conditions of the investment, including any options, rights, or contingencies retained by either party
- In addition, the agreement sets out a comprehensive list of representations and warranties of the entrepreneur (intended to protect the investor), as well as a list of covenants and undertakings

Covenants and undertakings

- Covenants and undertakings that are agreed to by the entrepreneur are intended to ensure that the investor's capital is used in the manner envisioned at the time of the agreement
- A covenant is a promise of future action or non-action
- Of course, the agreement can also include covenants and undertakings of the investor, such as provide additional funding if a given milestone is achieved

Ratchets and antidilution rights

- Protects the investor from the possibility of a lower valuation in a subsequent financing round
- If valuation declines, earlier investors gets enough free shares to make their overall average cost per share equal to that of the new investor
- May make an investor willing to accept a smaller stake for a given level of investment
- Can make subsequent financing difficult or even impossible to raise

Ratchets and antidilution rights

- Example: An investor purchases 100,000 shares with antidilution rights for $2,00 per share. In a subsequent financing round, a new investor invests $75.000 for 50.000 shares. How many new shares must the first investor be given under the antidilution provision?

$$\textit{Total investment}_{\textit{Old}} = \textit{\$2,00/share x 100.000 shares} = \textit{\$200.000}$$

$$\textit{Share price}_{\textit{New}} = \textit{\$75.000} \div \textit{50.000 shares} = \textit{\$1,50}$$

$$\textit{Number of shares}_{\textit{Old}} = \textit{\$200.000} \div \textit{\$1,50} = \textit{133.333}$$

$$\textit{New shares to old investor} = \textit{133.333} - \textit{100.000} = \textit{33.000 shares}$$

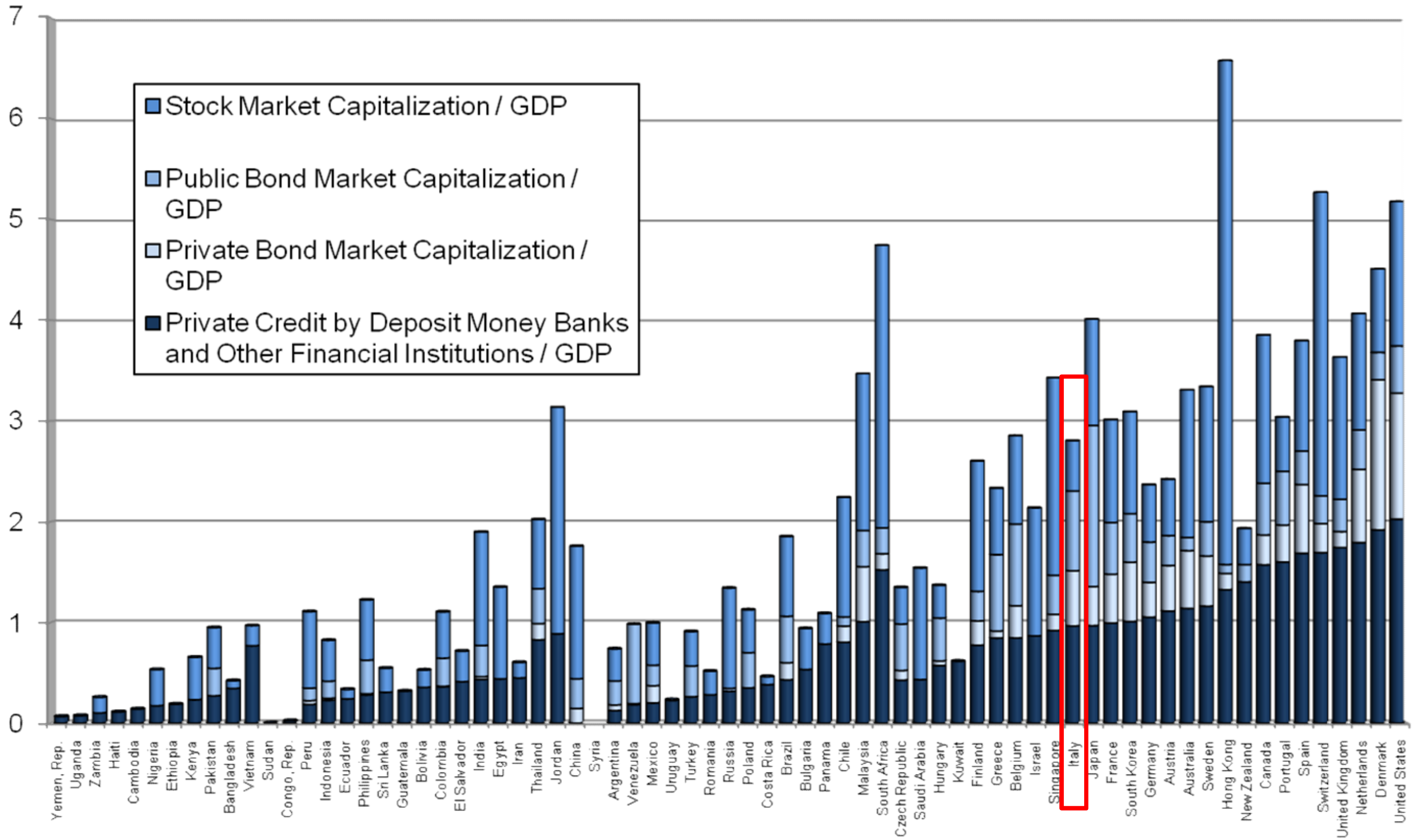
- If the original investor gets more shares for free, then the new investor will not value the deal at $2,00. The price must be lower to compensate for dilution of the value caused by the ratchet

International differences in new venture funding

- Type and availability of funding varies globally
  - enforceability of contracts
  - institutionalization of investment management
  - overall societal wealth
  - level of entrepreneurial activity

- Ventures in emerging markets rely more on
  - trade financing
  - family and friends for equity

Worldwide Sources of Business Financing, 2007
(Cumulative Totals as Multiples of GDP)



Chapter 4

NEW VENTURE STRATEGY AND REAL OPTIONS

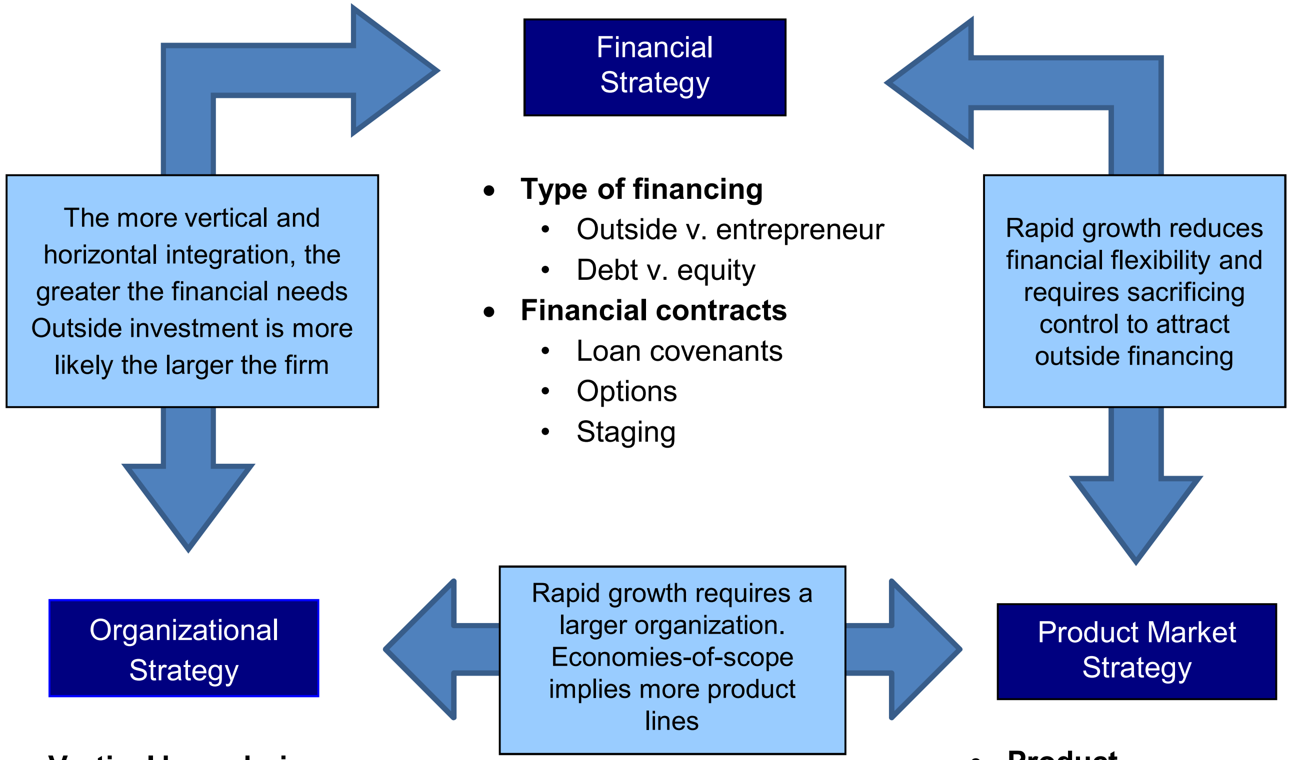
Strategic planning and its framework

- Strategic planning is about choosing a course of action designed to achieve a particular objective
- Strategic plans offer the opportunity to change course (real options)
- The ability to pursue a strategy may depend on the availability of financing
- Describes real options as decision trees (or game trees)
- Identify the objective and the strategic alternative for achieving it
- Uses investment valuation to compare alternative strategies

Product-market, financial, and organizational strategy

- Financial: defines the type and timing of financing
- Product-market: involves targeted sales growth rate, product price, product quality
- Organizational: concerns the horizontal and vertical boundaries of the firm
- Product-market, organizational, and financial decisions need to be viewed simultaneously

Interactive financial strategy



Financial Strategy:

- **Type of financing**
  - Outside v. entrepreneur
  - Debt v. equity
- **Financial contracts**
  - Loan covenants
  - Options
  - Staging

Organizational Strategy:

- **Vertical boundaries**
- **Horizontal boundaries**
  - Scale and scope

Product Market Strategy:

- **Product**
  - Price
  - Margin
  - Quality
  - Differentiation
- **Targeted sales growth**

Henry Ford and the model T

- A typical case of interdependencies of strategic choices
- Mass production was only part of the story
- True genius was
  - perceiving the vast market for sales of low-priced automobiles
  - recognizing that high-volume mass production would reduce costs
  - solving the financing problem
    - assembly rather than manufacturing
    - trade credit
    - sell to dealers for cash

What makes a plan or decision strategic?

- Strategic decisions:
  - Are consequential
  - Involve substantial commitments of time and resources
  - Are both active (we) and reactive (competitors)
  - Strategic decisions are not costless to reverse

  - Investment made to pursue the first course of action are, to some extent, sunk
  - Sunk investments limit flexibility because the full cost of changing direction must be compared to only the incremental cost of continuing in the same direction
  - An initial wrong strategic choice is one from which the decision maker may never fully recover

Financial strategy

- A financing choice can limit future financing options in a variety of ways
  - Contractual provisions of a debt agreement may restrict the firm's ability to redeem the debt and replace it with equity
  - Existing debt financing may limit the financing available for new projects
  - Debt service requirements may limit the firm's ability to undertake new project that would generate negative cash flows in the short run
- Competitive interdependencies also are present
- The scope of financial strategy is quite broad
  - type of financing
  - amount of financing
  - financial contracting

The scope of financial strategy

- The scope of financial strategy goes beyond the simple debt versus equity financing decision and include such considerations as the connections between financing choices and growth, flexibility and control

- In addition financial strategy includes such choices as the use of financial contracts to address or overcome informational asymmetries between entrepreneurs and investors, and to better align the incentives of entrepreneurs and employees with investor interest

Deciding on the objective

- Objective is maximize the entrepreneur’s return
- A two-step process:
  1. Select the strategy that yields the highest estimated NPV to the entrepreneur
  2. Make adjustments to the NPV by assigning subjective values to the qualitative considerations important to the entrepreneur
- Decision will be rational, i.e., the expected right choice given the information known at the time

Strategic planning for new ventures

- Plans are unconstrained by prior decisions
- Should simultaneously consider
  - product-market strategy
  - organizational strategy
  - financial strategy

Product – market, financial and organizational strategy

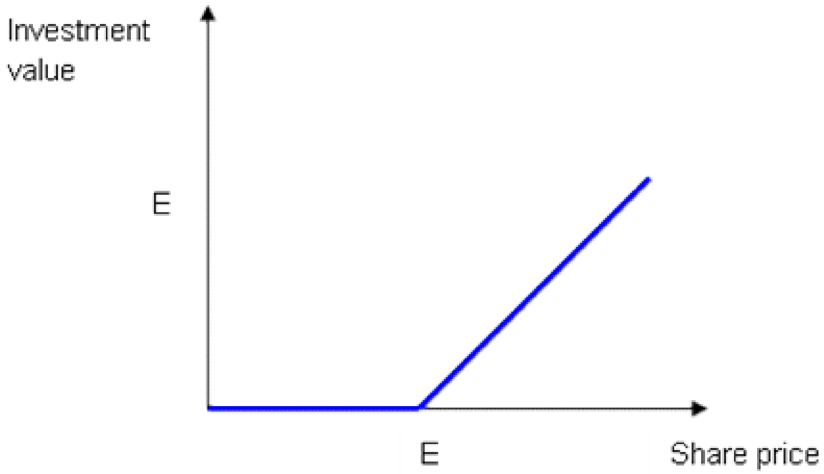
		Product-market Choice	
		Slow growth	**Rapid growth**
Organizational Choice	**One-level entry** (manufacturing level)	Initially financed by entrepreneur, growth financed with operating cash flows NPV = 40	Initially financed by entrepreneur, growth financed with operating cash flows and outside financing NPV = 120
	Integrated entry (manufacturing and distribution level)	Initial financing includes outside equity, growth financed with operating cash flows NPV = -20	Initial financing includes outside equity, growth financed with operating cash flows and outside financing NPV = 70

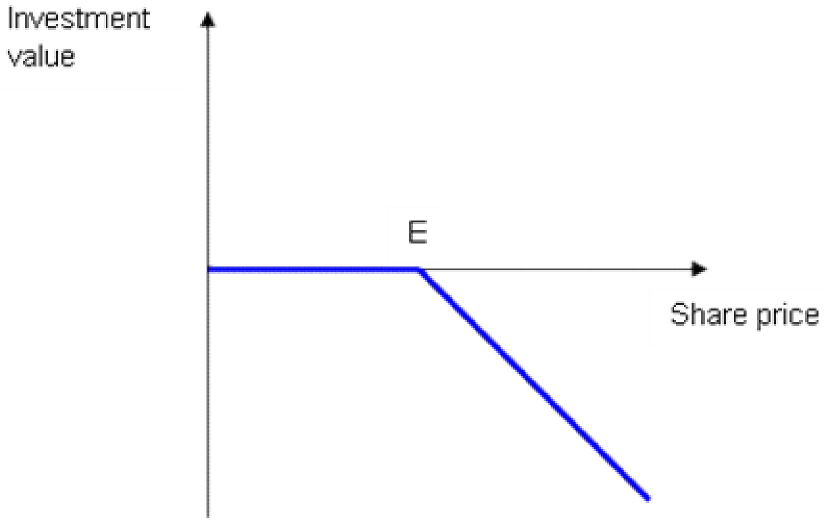
Product-market and organizational strategic choices are interdependent with financing choices. One-level entry combined with slow growth minimizes immediate and on-going needs for external financing. Integrated entry and rapid growth normally require higher levels of immediate and on-going external financing

An introduction to options

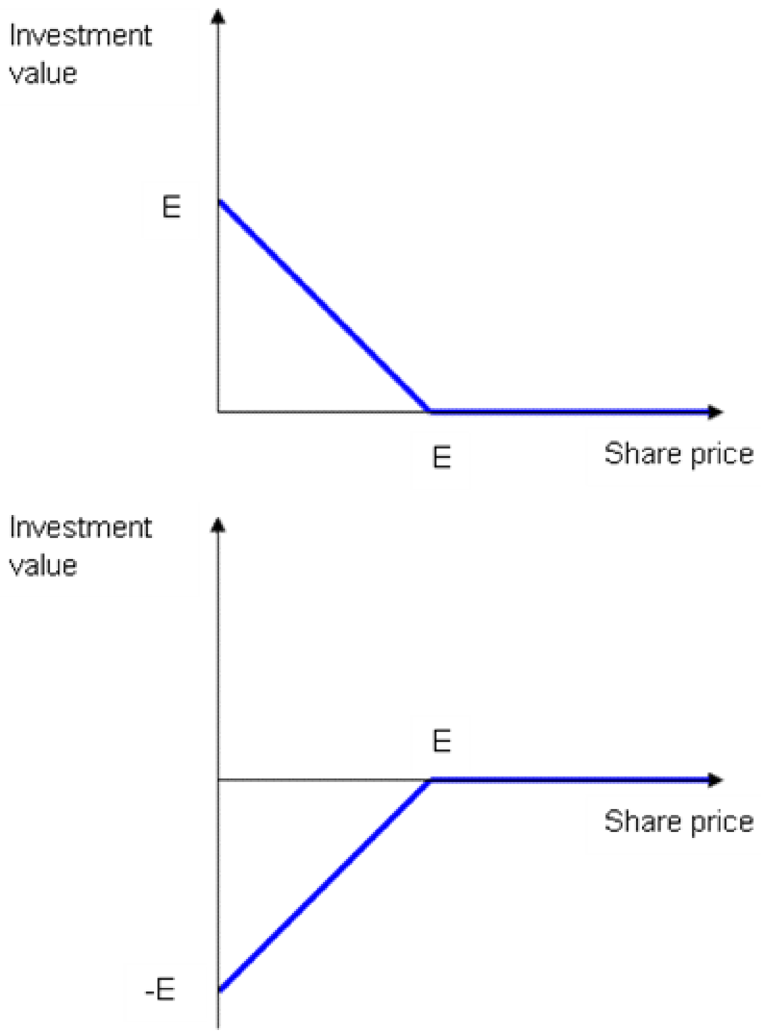
- An option is the right to buy or sell an underlying asset in the future on terms that are established at the beginning of the contract
- Elements of an option:
  - An underlying asset
  - Exercise price (strike price)
  - Expiration date
  - European or American form
- Basic type of options:
  - Call
    - It is the right to buy the underlying asset at the strike price
  - Put
    - It is the right to sell the underlying asset at the strike price

Call option


Investment value
E
E
Share price


Investment value
E
Share price

Put option


Investment value
E
E
Share price
Investment value
E
Share price
-E

The value of an option

- Factors that affect the call option value
  - Market price of the underlying asset
    - It gains value if the market price of the underlying asset rises, and loses value if the price of the asset falls
  - Volatility (risk) of the underlying asset
    - The more volatile the underlying asset, the higher the value of an option on the asset
  - Time to option expiration
    - Because volatility increases with time to expiration, long-term options are more valuable
  - Time value of money
    - If you buy a call, you do not have to come up with the money to exercise the option until you decide to do so
    - Because the value of not having to pay money today is greater the higher the interest rate (opportunity cost), call options increase in value with increases in the cost of money

The value of an option

- Factors that affect the put option value
  - Market price of the underlying asset
  - Volatility (risk) of the underlying asset
  - Time to option expiration
  - Time value of money

- In contrast to calls, puts gain value when underlying asset values are low and exercise prices are high
- However, like a call option, a put option is more valuable when the underlying asset is riskier
- In contrast to calls, put options are less valuable if the cost of money is high (more interest income is foregone)

- Stock price + Put value = Call value + PV(exercise price)

Real options

- Real options occur when managers can influence the size and risk of project's cash flows by taking different actions during the project's life
- They are referred to as real options because they deal with real assets as opposed to financial assets
- The formal models used to value financial options can overstate the value of real options owing to lack of a ready market for the options or the underlying assets
- Real options, in contrast to financial options, often are interdependent, and the decision to exercise one may have implications for the values of others. For these reasons the value of a portfolio of real options usually cannot be determinated by simply adding up the values of the individual options

Real options

- Defer
  - Investing now eliminates the option to defer (learning)
- Expand
  - An option to defer part of the scale of investment
- Contract
  - The flexibility to reduce the rate of output
- Abandon
  - Stop investing, and liquidate existing assets
- Staging
  - Substitute a series of small investments for one large
- Switching
  - Re-deploy resources or change inputs

Examples of Real Options

Option	Description	Examples
Defer	To wait before taking an action until more is known or timing is expected to be more favorable	When to harvest a stand of trees, introduce a new product, or replace an existing piece of equipment
Expand or contract	To increase or decrease the scale of a operation in response to demand	Adding or subtracting to the daily flights on an airline route or adding memory to a computer
Abandon	To discontinue an operation and liquidate the assets	Discontinuing a research project, closing a store, or resigning from current employment
Stage investment	To commit investment in stages giving rise to a series of valuations and abandonment options	Staging of research and development projects or financial commitments to a new venture
Switch inputs or outputs	To alter the mix of inputs or outputs of a production process in response to market prices	The output mix of refined crude oil products or substituting coal for natural gas to produce electricity
Grow	To expand the scope of activities to capitalize on new perceived opportunities	

Decision trees

- A decision tree is a way to conceptualize and compare the value of strategic alternatives
- The process of constructing a decision tree imposes discipline on the evaluation process and helps entrepreneur identify relevant real options and point at which critical decisions must be made
- It also enables the entrepreneur to assess, in a structured way, the connections between decisions made today and the value of the venture in the future
- The decision maker is uncertain about which state of the world will be realized but knows or estimates the probabilities of the different states

Decision trees

- Techniques for reasoning through decision trees:
  - Focus on the most important decisions
    - Focusing on a few critical decisions and a few discrete choices is all that usually is needed or useful
  - Construct the tree by reasoning forward
    - Sequencing is chronological. You need to keep track of how one choice limits the options for subsequent decisions
  - At each decision point, keep track of what you know and what you don't know
    - You can only base today's decisions on expected future "quantities"
  - Evaluate the choices by calculating backward
    - Start with the last decision point (the terminal node) and compare the values of the alternatives that emanate from that node
  - Select the tree branch with the highest expected value
    - The process of backward induction leads to a set of valuation that reflect the values of the embedded options in the decision process

Decision tree example: assumptions

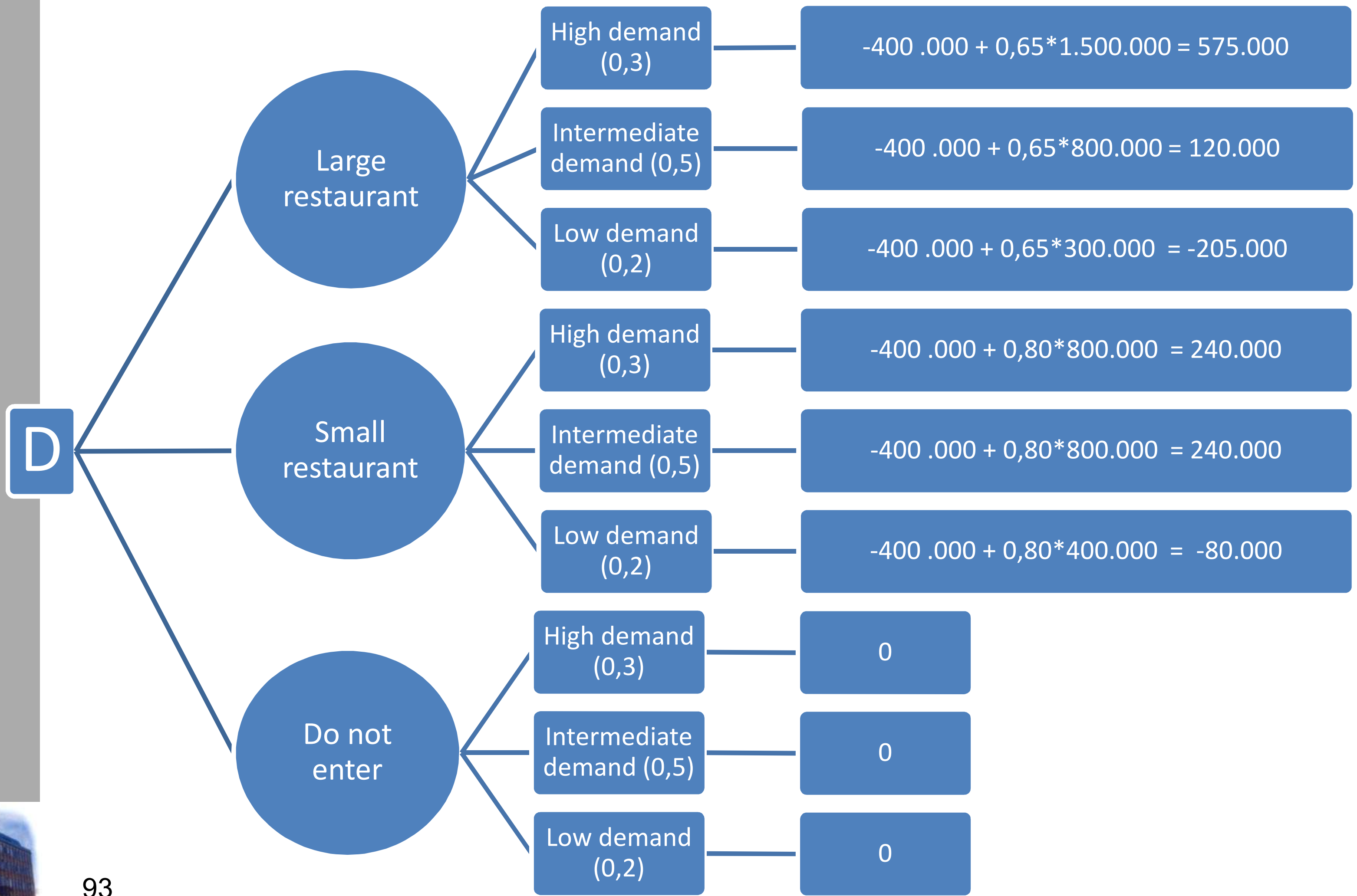
- We suppose an entrepreneur is considering investing in a restaurant
- Demand may be:
  - High: 30%
  - Medium: 50%
  - Low: 20%
- Dimension and cost of the restaurant:
  - Large restaurant: 750.000$
  - Small restaurant: 600.000$
  - Not entering in the business
- Investment:
  - Entrepreneur: $400.000
  - Outside investor: the difference
  - Outside investor requires 1% of equity for each $10.000 invested (35% large restaurant, 20% small restaurant)

Decision tree example: assumptions

Demand	***Prob.***	***Dimension***		
		Large	*Small*	*Not enter*
High demand	30%	1.500.000	800.000	0
Medium demand	50%	800.000	800.000	0
Low demand	20%	300.000	400.000	0

- The present values of future cash flows under different hypothesis
- The difference is due to the higher fixed cost of the large restaurant
- Outside investor requires 1% of the equity for each 10.000$ invested, resulting in a 35% interest in the larger restaurant or a 20% interest in the smaller one.

Decision tree example: results



Decision tree example: results

- Do not enter:
  - NPV:
    - High demand, Intermediate demand and Low demand 0$

- Large – scale entry:
  - NPV conditional on:
    - High demand 575.000$
    - Intermediate demand 120.000$
    - Low demand -205.000$
  - NPV of the large restaurant:

    30% * 575.000 + 50% * 120.000 + 20% * (-205.000)

    NPV = 191.500$

Decision tree example: results

- Small – scale entry:
  - NPV conditional on:
    - High demand 240.000$
    - Intermediate demand 240.000$
    - Low demand -80.000$
  - NPV of the small restaurant:

    30% * 240.000 + 50% * 240.000 + 20% * (-80.000)

    NPV = 176.000$

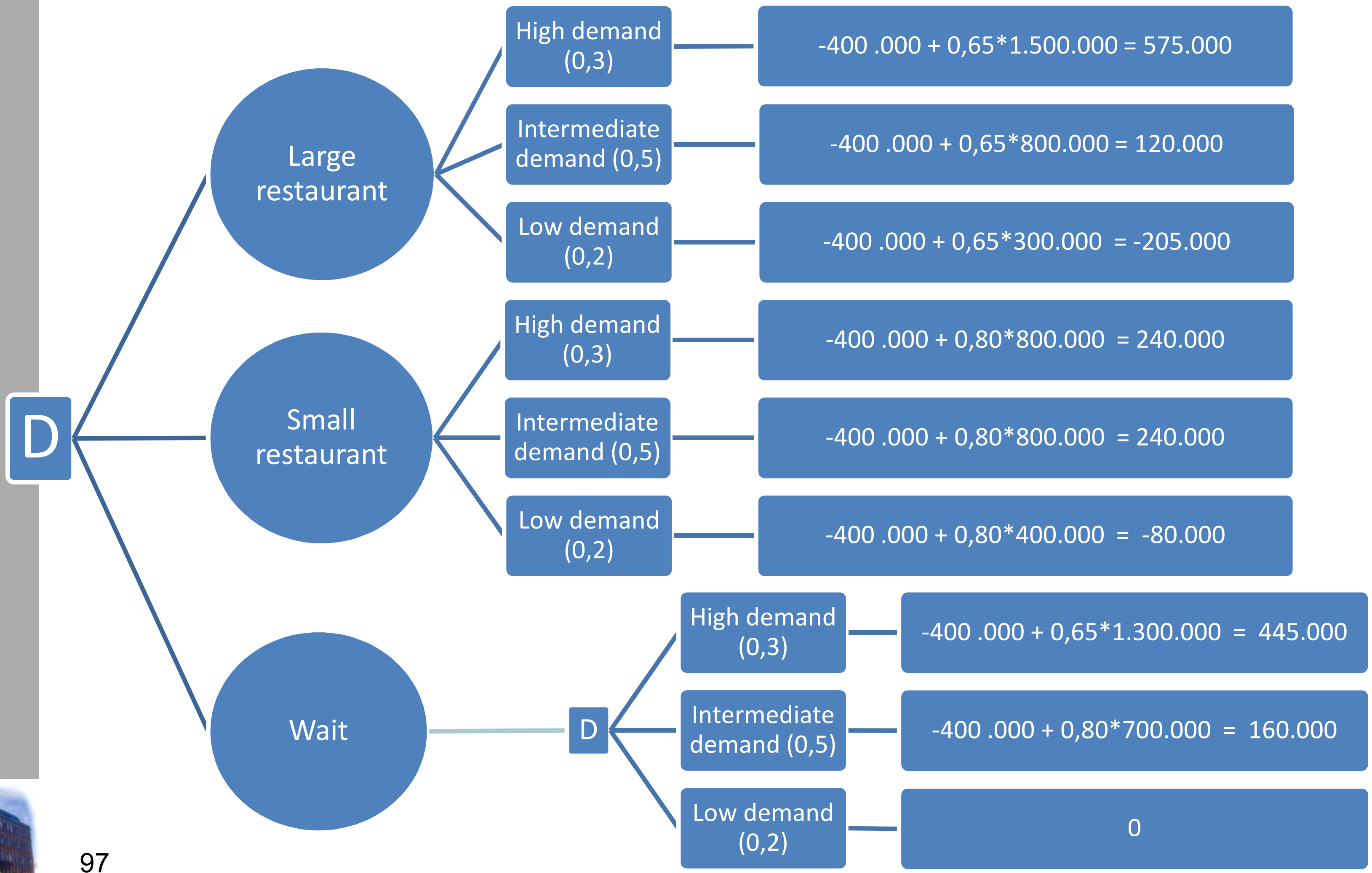
- At the time of the decision, given what is know, and the relative probabilities of the different states, building the <u>large restaurant</u> is the best alternative
- The are no real options reflected in the decision

Evaluation of option to delay

- Delay until uncertainty is resolved:
  - For simplicity we assume that, by waiting, the entrepreneur will be able to determine the state with certainty so that in each state, the highest valued (for him) size of restaurant can be built
  - Waiting can add value because uncertainty is reduced or because waiting defers expenditures of resources until they are more immediately needed
  - The offsetting cost is that waiting may encourage others to enter the market or market conditions may change
  - The option to wait is a call option

Demand		***Dimension***	
	Large	*Small*	*Wait*
High demand	1.500.000	800.000	1.300.000
Medium demand	800.000	800.000	700.000
Low demand	300.000	400.000	0

Decision tree example: option to delay investment



Evaluation of option to delay

- NPV conditional:
  - High demand
    - Build large restaurant NPV = $445,000
  - Intermediate demand
    - Build small restaurant NPV = $160,000
  - Low demand
    - Do not enter NPV = $0

- NPV of delay strategy:

  30% * 445.000 + 50% * 160.000 + 20% * 0

  NPV = 213.500$

- Large-scale entry strategy: NPV = **191.500$**

- Value of option to delay = 213.500 – 191.500

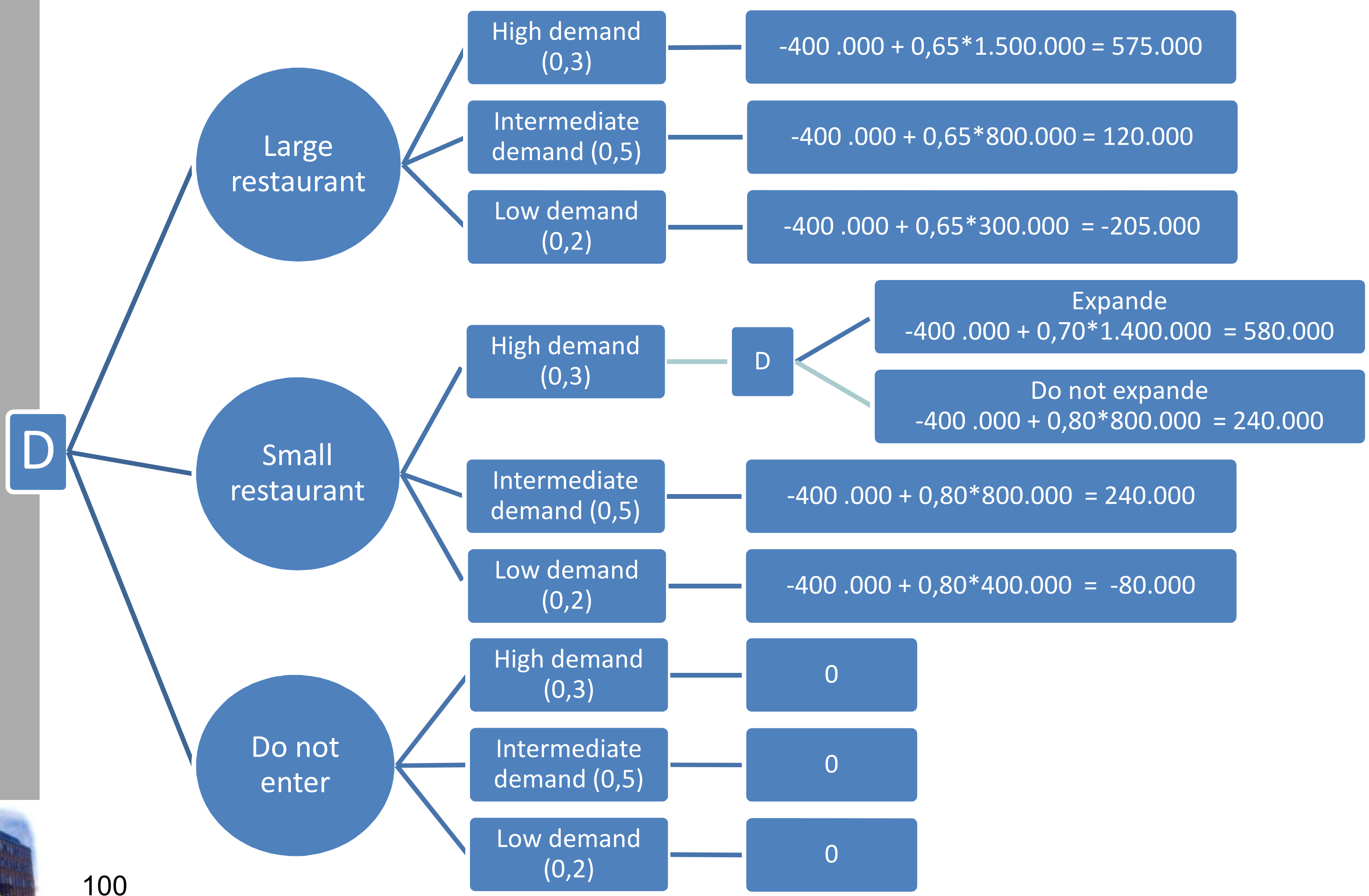
  (rough measure of the value of the real option) = **22.000$**

Evaluation of option to expand

- An expansion option is the option to increase the amount of the investment after the initial investment has been made
  - After the initial investment in the small restaurant (600.000$), it can be expanded to the large size by investing an additional $200.000
  - This money come from the outside investor; he asks 1% of the equity for each $20.000 invested
  - The outside investor will have 30% of the venture, in the event of expansion

Demand	***Dimension***		
	Large	*Small*	*Expand from small*
High demand	1.500.000	800.000	1.400.000
Medium demand	800.000	800.000	0
Low demand	300.000	400.000	0

Decision tree example: option to expand initial investment



Evaluation of option to expand

- NPV conditional:
  - High demand
    - Expand to large restaurant NPV = $580.000
    - Remain small NPV = $240.000
- NPV of small scale entry with option to expand:

  30% * 580.000 + 50% * 240.000 + 20% * -80.000

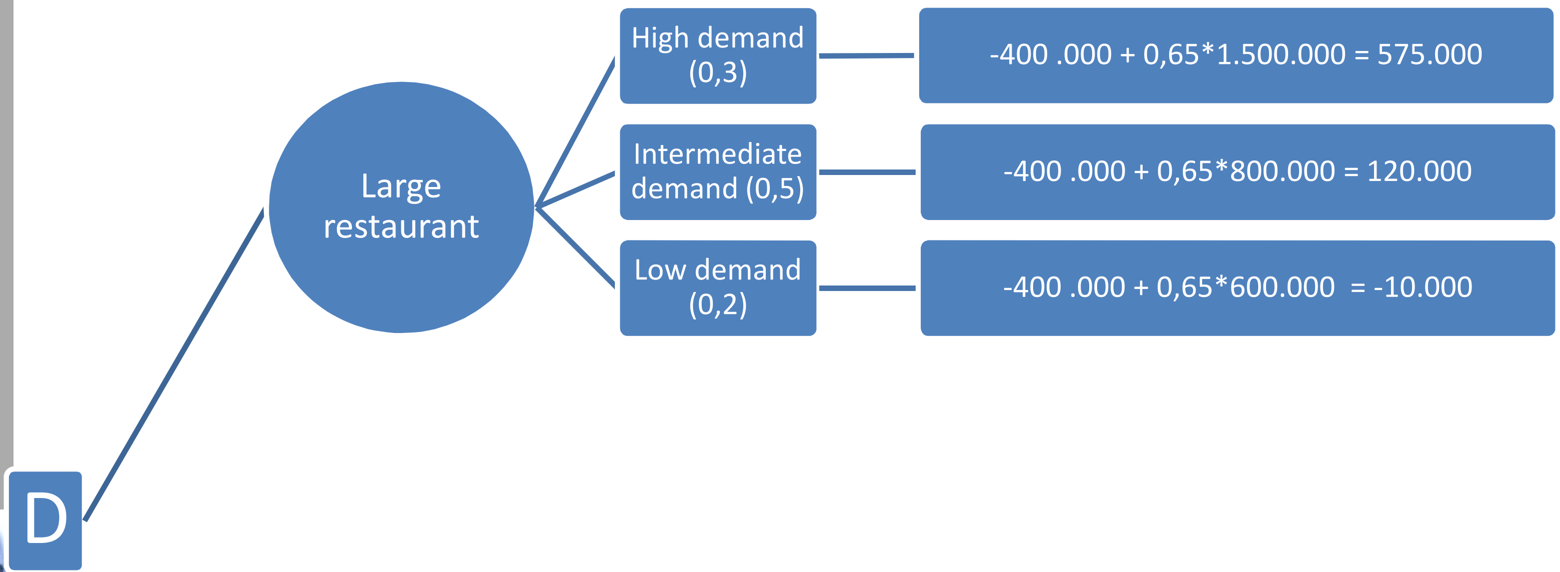
  NPV = 278.000$
- Large-scale entry strategy: NPV = **191.500$**
- Delay strategy: NPV = **213.500$**
- Value of expansion option = 278.000 – 191.500
  = **86.500$**
- Incremental value over delay option = **64.500$**
- The options are mutually exclusive

Evaluation of option to abandon

- This option gives the entrepreneur the option to abandon the venture if things do not work out as well as expected
- Suppose the restaurant facility, large or small, has alternative use as office space
- If converted to office space, the present value would be:
  - 600.000$ for the large restaurant
  - 300.000$ for the small restaurant
- **Small restaurant** entry with abandonment option:
  - This option is worthless. This is because a small restaurant – even in the low-demand state – has a present value of $400.000, which is more than its present value as office space ($300.000)

Evaluation of option to abandon

- **Large restaurant** entry with abandonment option:
  - For large restaurant, the option does have value because $600.000 is more than $300.000 (the present value as restaurant in the low-state demand)
  - In case of conversion into office space, the entrepreneur will obtain $390.000 (65% of the value)



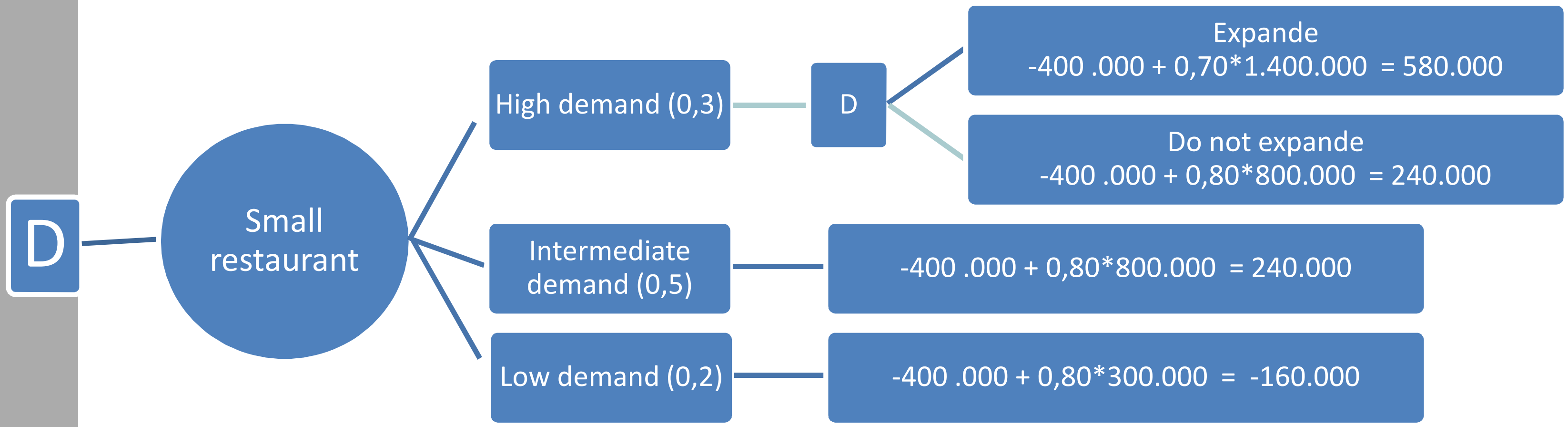
Evaluation of option to abandon

- **Large restaurant** entry with abandonment option:
  - The net present value to the entrepreneur from investing immediately in the large restaurant with the abandon option in low demand scenario is:

    30% * 575.000 + 50% * 120.000 + 20% * -10.000

    NPV = 230.500$
  - This amount is less than the value of the strategy of initially investing in the small restaurant, with the option to expand, but is higher than any other alternatives
- Large-scale entry strategy: NPV = **191.500$**
- Large-scale + abandon strategy: NPV = **230.500$**
- Value of abandon option = 230.500 – 191.500 = **39.000$**

Small-scale entry with expansion and abandonment options



Small-scale entry with expansion and abandonment options

- Small restaurant entry with expansion and abandonment option:
    - The net present value to the entrepreneur from this strategy is:

      30% * 580.000 + 50% * 240.000 + 20% * -160.000

      NPV = 262.000$
    - This amount is less than the value of the strategy of initially investing in the small restaurant, with the option to expand
- Small-scale + expansion option: NPV = **278.000$**
- Small-scale + expansion + abandon: NPV = **262.000$**
- Value of expansion + abandon = 278.000 – 262.000 = **-16.000$**
- Abandonment has negative value for the small restaurant

Games trees

- Decision trees analysis – used to value strategic alternatives – does not explicitly incorporate the reactions of rivals
- Rivals reactions are likely to affect decision making in settings where there are only a few competitors
- Decisions of the various firms can be highly interdependent
- For a small venture entering a large market, it make sense to think of the market as perfectly competitive (no specific reaction)
- It is possible to model the reactions of the rivals and to determine what reaction would be in the best interest of each rival: the objective is to select the strategy that maximizes value given what you believe your rival will do

Game trees

- The Basics
  - Players
    - They are assumed to behave in a self-interested, rational way
    - They are decision makers such as an entrepreneur, a firm manager, a venture capitalist, or a rival
    - They are called on to make decisions at various point in a game (decision nodes)
    - In a game-theoretic setting, player action are strategic and driven by rationality
  - Order of play
    - Sequential-move game: all players make the decisions one at a time in a sequence
    - Simultaneous-move game: the decisions are made at one time
  - Information set available to the players
  - Set of available actions to each player
  - Payoff schedules that results from the outcome of the actions of the players

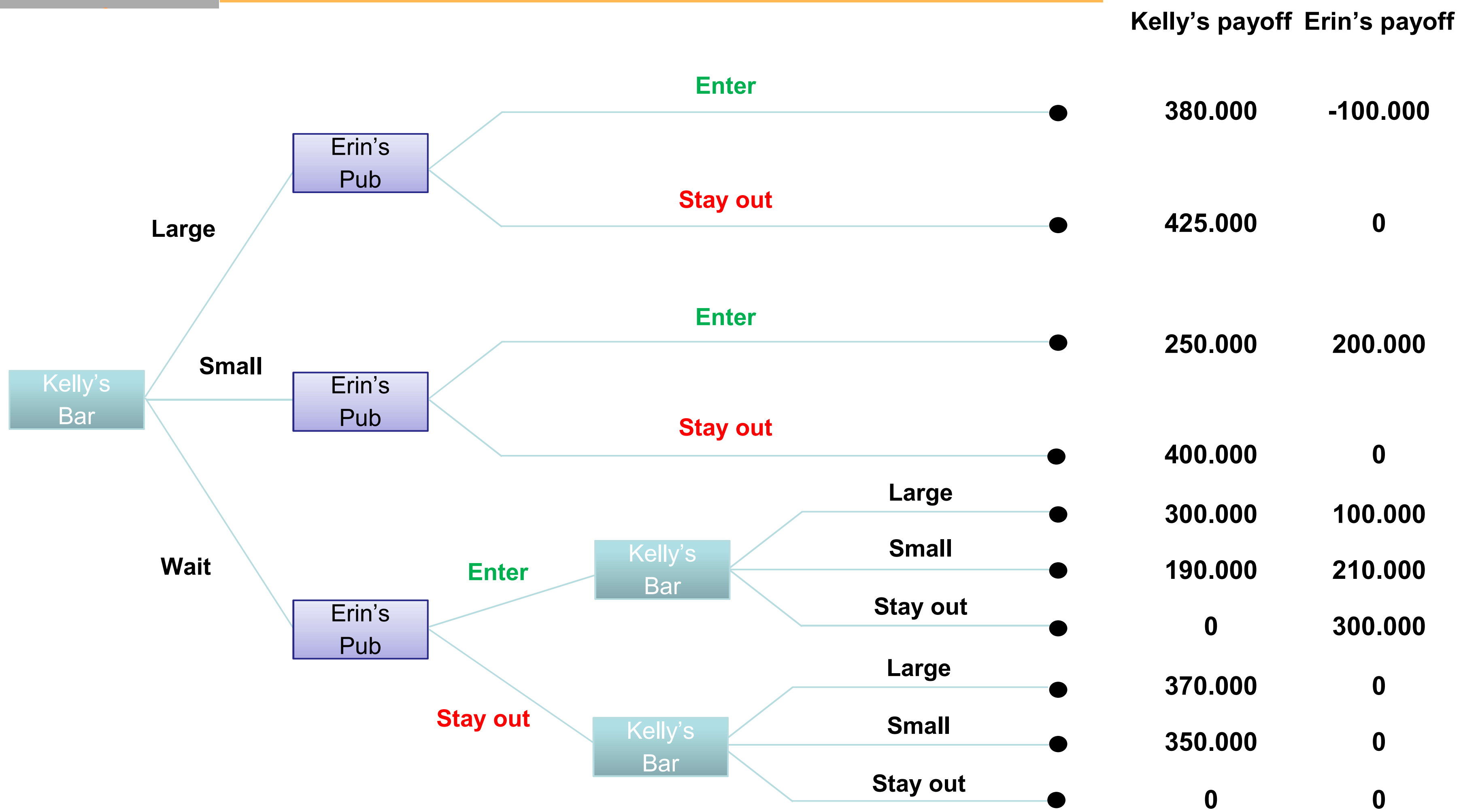
Game trees

- Strategic interaction
  - Cooperative and non-cooperative games
  - Sequential-move game
  - Simultaneous-move game
- Nash equilibrium
  - In a non-cooperative game, the players cannot enter into binding, enforceable agreements with each other
  - Any solution of a non-cooperative game must be a Nash equilibrium
  - A Nash equilibrium is a collection of strategies, one for each player, such that each player's strategy is optimal given the strategy of the other player (or players)
  - In equilibrium neither party has an incentive to change strategy, but…
- Sub-game perfection
  - ..the result does not maximize the combined profits of both players

Game tree: an example

- Kelly is interested in quitting her job and opening her own bar, Kelly's bar, in the small town where she lives
- She can:
  - Enter with a large bar
  - Enter with a small bar
  - Wait to see if the town's economy will support another bar
- Her biggest concern is a rumor that a national franchiser, Erin, is considering opening a pub in the town
- Since Erin's Pub is a business format franchise (one size only), Erin is considering two options: enter or stay out
- The payoffs for both players are expressed in term of NPV
- We suppose that the game is sequential and that by acting quickly, Kelly can make the first move
- If Kelly decides to wait, she knows Erin will enter

Game tree: an example



Kelly prefer large scale entry. Given Erin's expected reaction of staying out of the market, Kelly expects to earn 425.000 in NPV

Università di Trieste
DEAMS – Bruno de' Finetti

Game tree illustration: Nash equilibrium

- If Kelly enters with a large bar, Erin's best option is don't enter
- If Kelly enters with a small bar, Erin's best option is to also enter
- If Kelly waits, Erin's will enter since all payoffs are > $0
  - if Kelly then enters with large bar, Kelly's payoff = $300,000
  - if Kelly then enters with small bar, Kelly's payoff = $190,000
  - both are positive, but are also less than Kelly's payoff s from immediately entering with a large bar ($425,000/no Erin; $380,000/Erin enters)
- Nash Equilibrium: Kelly enters with a large bar and Erin does not enter

Games entrepreneurs play

- Strategic games commonly played by entrepreneurs include the following:
  - The business plan
    - An entrepreneur must decide how much optimism to build into the projections that are included in the plan. Overoptimism can be dangerous
  - Strategic partnering
    - An entrepreneur must decide whether to bring in a vertically integrated company as a distributor and strategic partner or risk the possibility that, if not invited to partner, the corporation will independently develop a competing product
  - Control
    - An entrepreneur must decide how much control to forsake in exchange for securing funding
  - Information disclosure
    - A new venture's management must decide whether to patent an idea now or maintain the idea as a trade secret

Strategic flexibility vs. strategic commitment

- Decision trees and game trees are useful for assessing tradeoffs between the value of maintaining flexibility (real options) and the value of committing to a more limited course of action
- Maintaining flexibility can create value if valuable information will be revealed with time
- Early commitment can create value by precluding competitive entry
- Important to consider the values of the various types of imbedded real options in any venture

Strategic planning and the business plan

- Entrepreneur may default into a course of action less valuable than a foregone alternative
- A well-structured plan enables the entrepreneur to identify and react to problems
- Not a one-shot exercise
- Projections have to be modified in light of actual experience, and to reassess overall strategy
- Having the original plan as a benchmark, revising the plan enables the entrepreneur to diagnose the problems and opportunities that may lead to revisions

New venture strategy and real options - summary

- Product-market, organizational, and financial strategies need to be considered simultaneously
- New ventures can be viewed as portfolios of real options
- Real options can enhance value by adding flexibility
- Decision trees and game trees are useful tools for analyzing real options and new venture strategy

Chapter 5

DEVELOPING BUSINESS STRATEGY USING SIMULATION

Simulation

- In general sense, a simulation is a representation of the behavior of a complex system through the use of another system (usually a computer)
- The normal way to represent uncertainty in a simulation model is to describe each element of uncertainty as a statistical distribution
- Applications of simulation:
  - Strategy formulation
  - Deal structuring
  - Risk allocation
  - Contingent claims analysis
  - Cash needs assessment
  - Staging of investments
  - Valuation

Simulation at Merck

- David Hertz and McKinsey & Co. first advocated using simulation for investment decision making in 1968. The technique was slow to catch on
- Drug development process is uncertain and expensive
  - R&D
  - testing
  - marketing
- Merck uses simulation to estimate the probability of success at each stage for each drug, future cash flows, and the expected NPV
- R&D as a portfolio of real options

Who relies on simulation?

- 70% of Fortune 500 companies
- Professional sports teams
- Simulation tools (Excel Add-ins):
  - *Venture*.SIM™
  - @Risk®
  - Crystal Ball®

Simulation – An illustration

- Suppose you are considering starting a new parcel delivery service
- You must determine the number of cubic feet of warehouse space you should lease in order to handle the December activity peak
- You believe the warehouse must be capable of handling 5000 boxes per day
- In addition, you know that, on average, boxes are 2 feet high, 1,5 feet wide, and 1,5 feet deep
- Using this information, you might estimate the warehouse space requirement as 4,5 cubic feet per box (2*1,5*1,5), time 5000 boxes, or 22.500 cubic feet

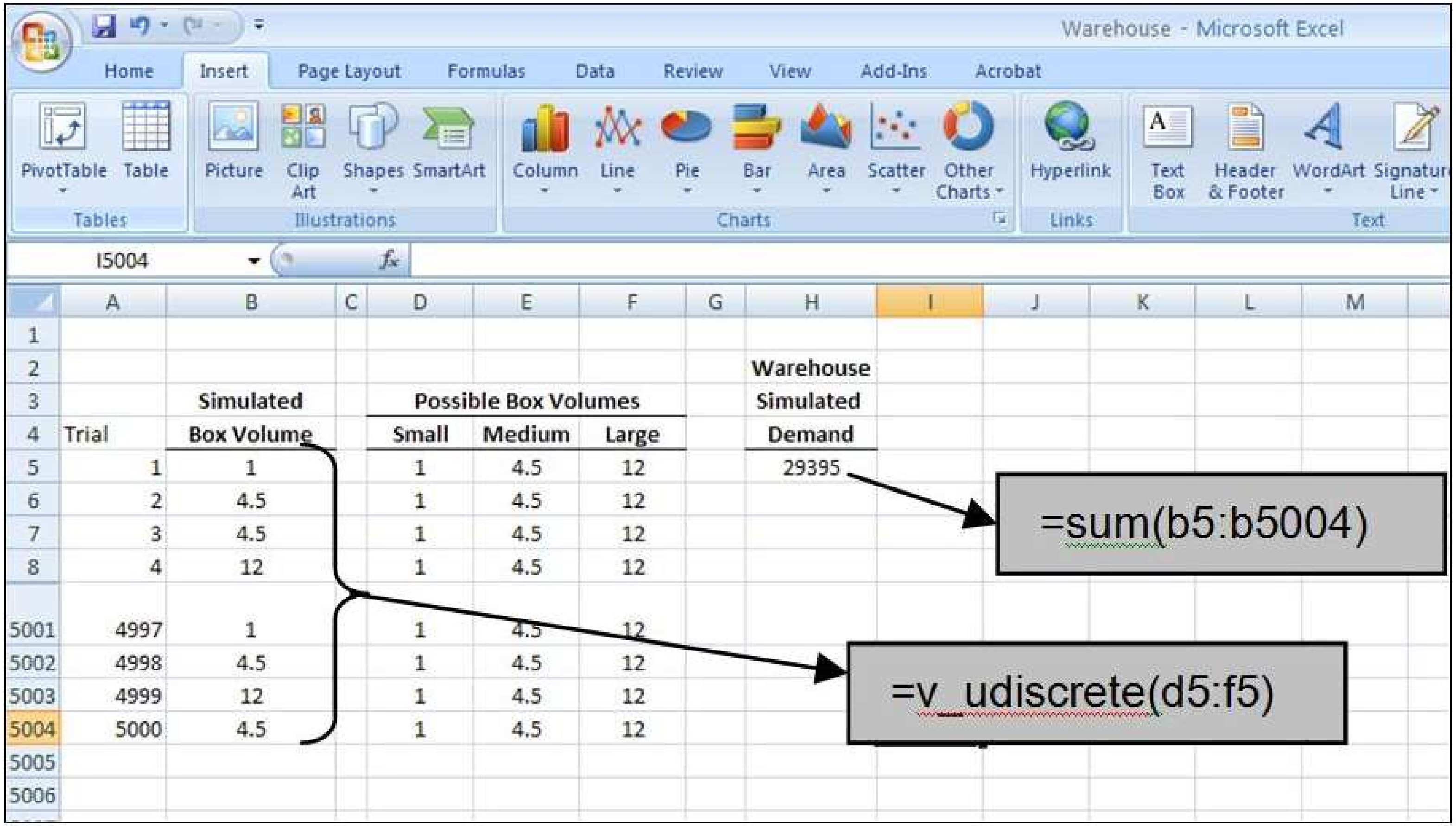
Simulation – An illustration

- Suppose the dimensions are correlated so that there are actually three different sizes of boxes:
  - 1 foot * 1 foot *1 foot ⇨ 1,0 cubic foot
  - 2 feet * 1,5 feet * 1,5 feet ⇨ 4,5 cubic feet
  - 3 feet * 2 feet * 2 feet ⇨ 12,0 cubic feet
- Each size of box is equally likely to be received and stored
- This make the average size per box not 4,5 cubic feet, but 5,833 cubic feet
- If you need to store 5000 boxes and there are exactly as many of each size, you will need 29.150 cubic feet of space (compared to 22.500 cubic feet)
- Simulation can be used to determine an amount of space that is adequate for the venture's needs most of the time, without wasting money

Simulation – An illustration

- You could take a very conservative approach and contract for enough space to hold 5.000 of the 12-cubic-foot boxes. But that is certain to be wasteful
- Suppose, based on your assessment of the cost of not having enough space, you have concluded that you would like to have enough to meet the demand 90 percent of the time
- Simulate the amount of warehouse space
  - volume per box = height x width x depth
  - Warehouse space needed = volume per box x 5.000 boxes
- Using simulation software we ask the computer to select at random 5000 boxes such that, each time, the probability of drawing a box of any of the three given sizes remains at one-third

Warehouse simulation model



Row	Trial	Simulated Box Volume	Possible Box Volumes: Small	Medium	Large	Warehouse Simulated Demand
5	1	1	1	4.5	12	29395
6	2	4.5	1	4.5	12	
7	3	4.5	1	4.5	12	
8	4	12	1	4.5	12	
5001	4997	1	1	4.5	12	
5002	4998	4.5	1	4.5	12	
5003	4999	12	1	4.5	12	
5004	5000	4.5	1	4.5	12	

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Warehouse simulation model

Panel (a) – *Venture*.SIM™ Summary Table

Unconditional Simulation Results

Trials = 10000

Venture.SIM

	Output	Average	Median	Standard Deviation	Skewness	Minimum	25%	50%	75%	Maximum
						Percentiles				
1	Cubic Feet Required	29166	29171	623	-0.040	27197	28616	29171	29728	30905

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Warehouse simulation model

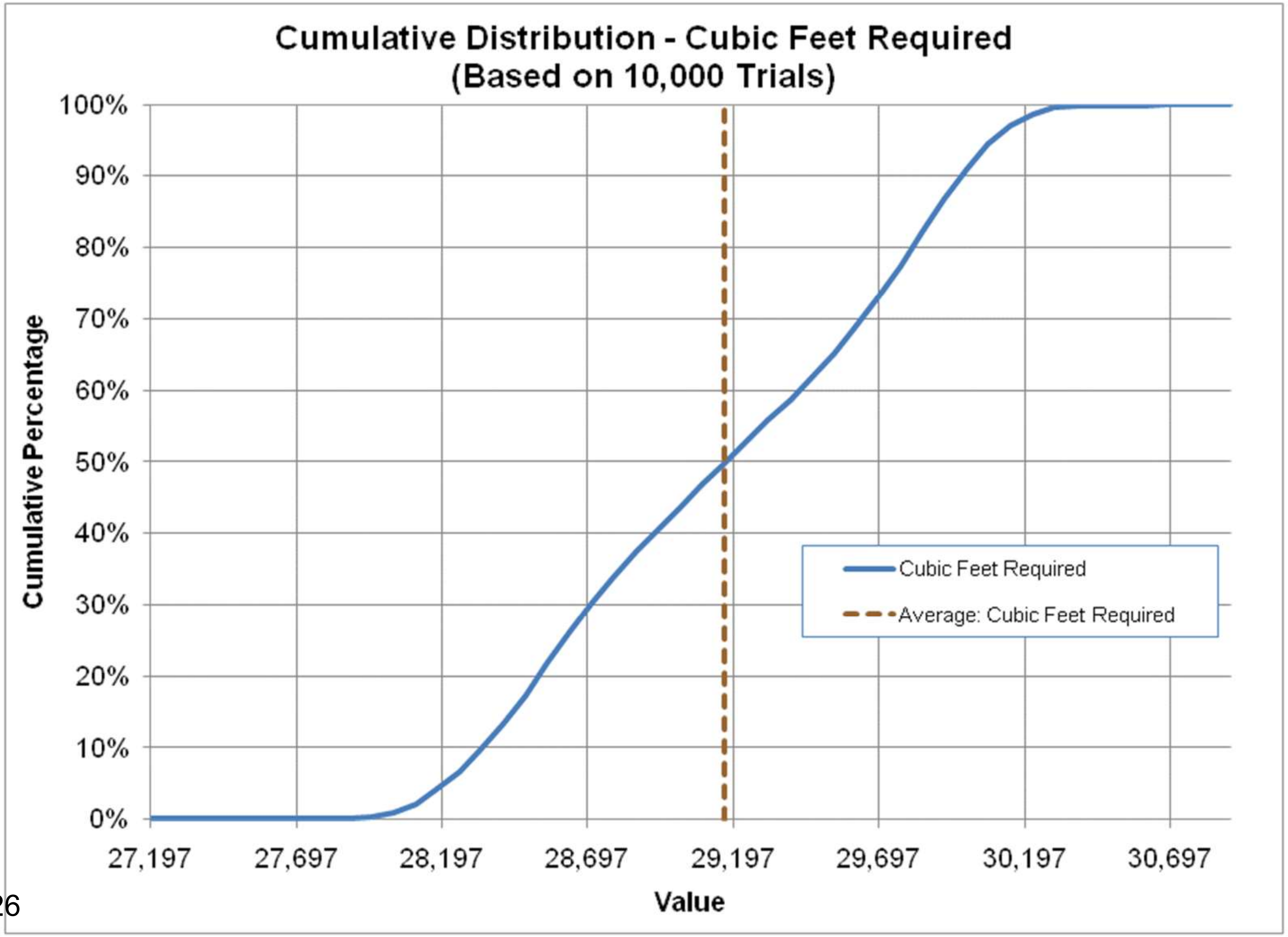
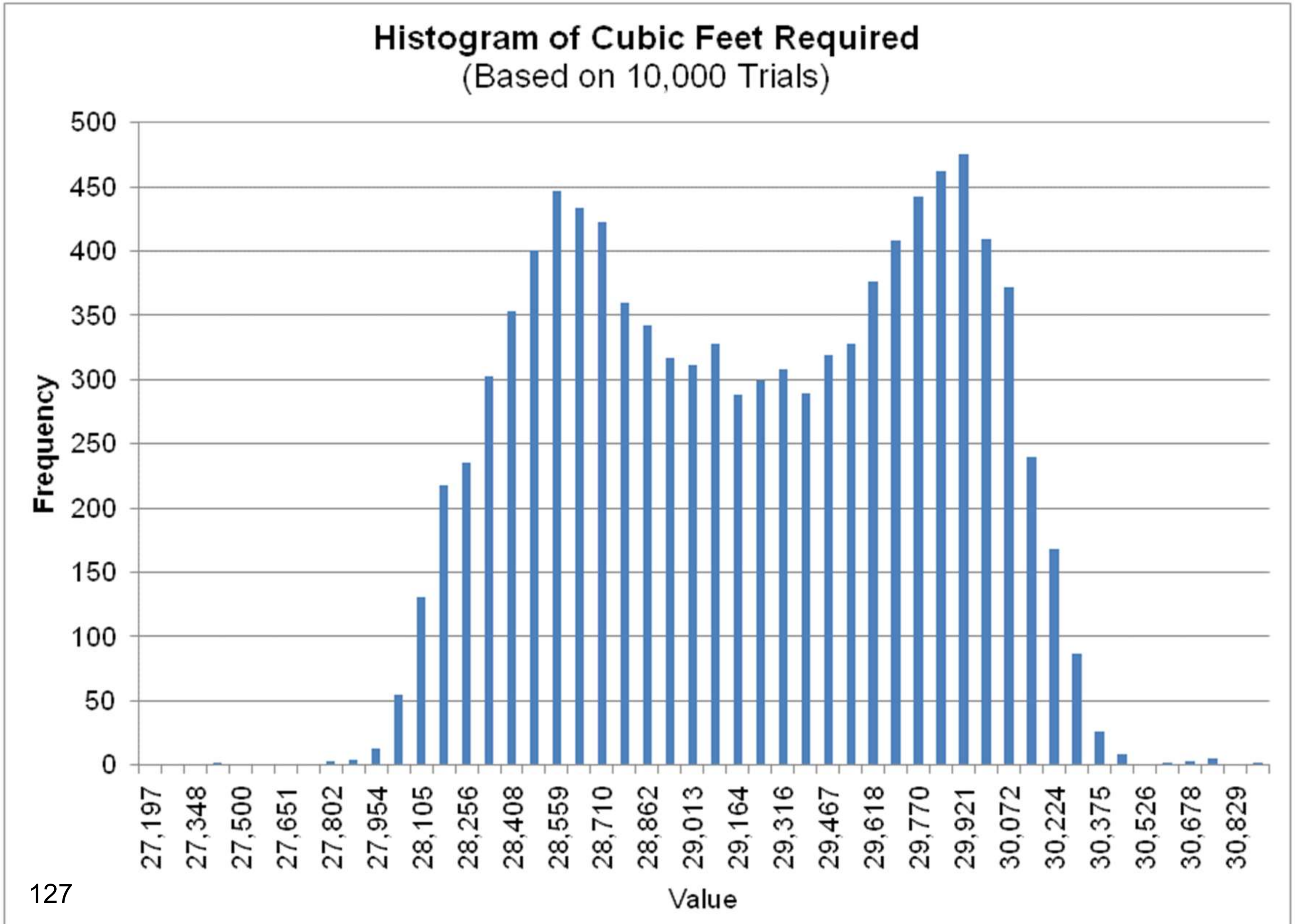


Figure 5.2

Warehouse simulation model



Warehouse simulation model

- Conclusions:
  - 29,171 cubic feet would be sufficient 50% of the time
  - 30,000 cubic feet would be sufficient 90% of the time
  - over 10,000 trials, the largest warehouse needed was 30,905 cubic feet
  - distribution of warehouse size is bimodal

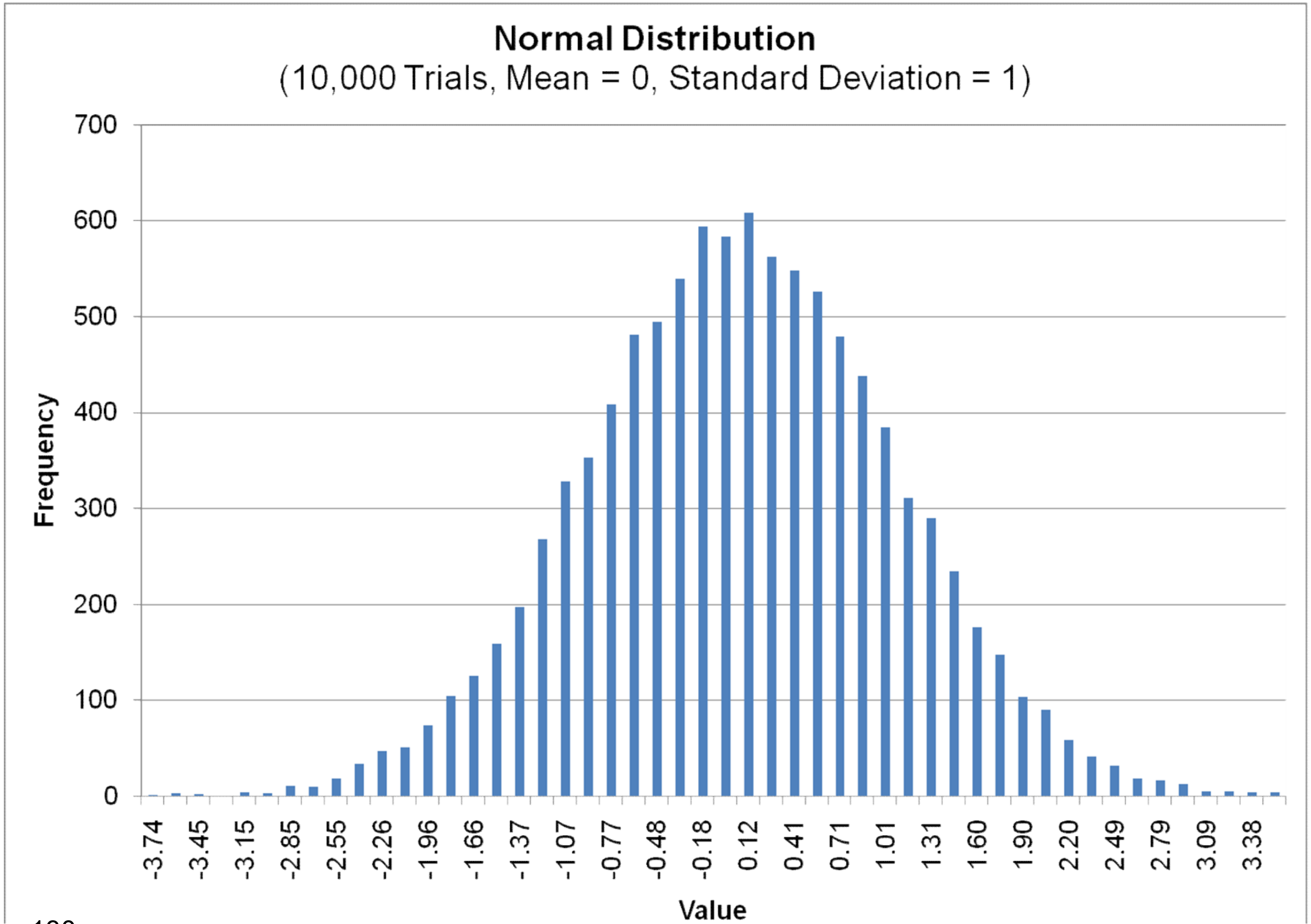
- Extensions:
  - vary number of boxes arriving daily
  - more variation in box size

Describing risk

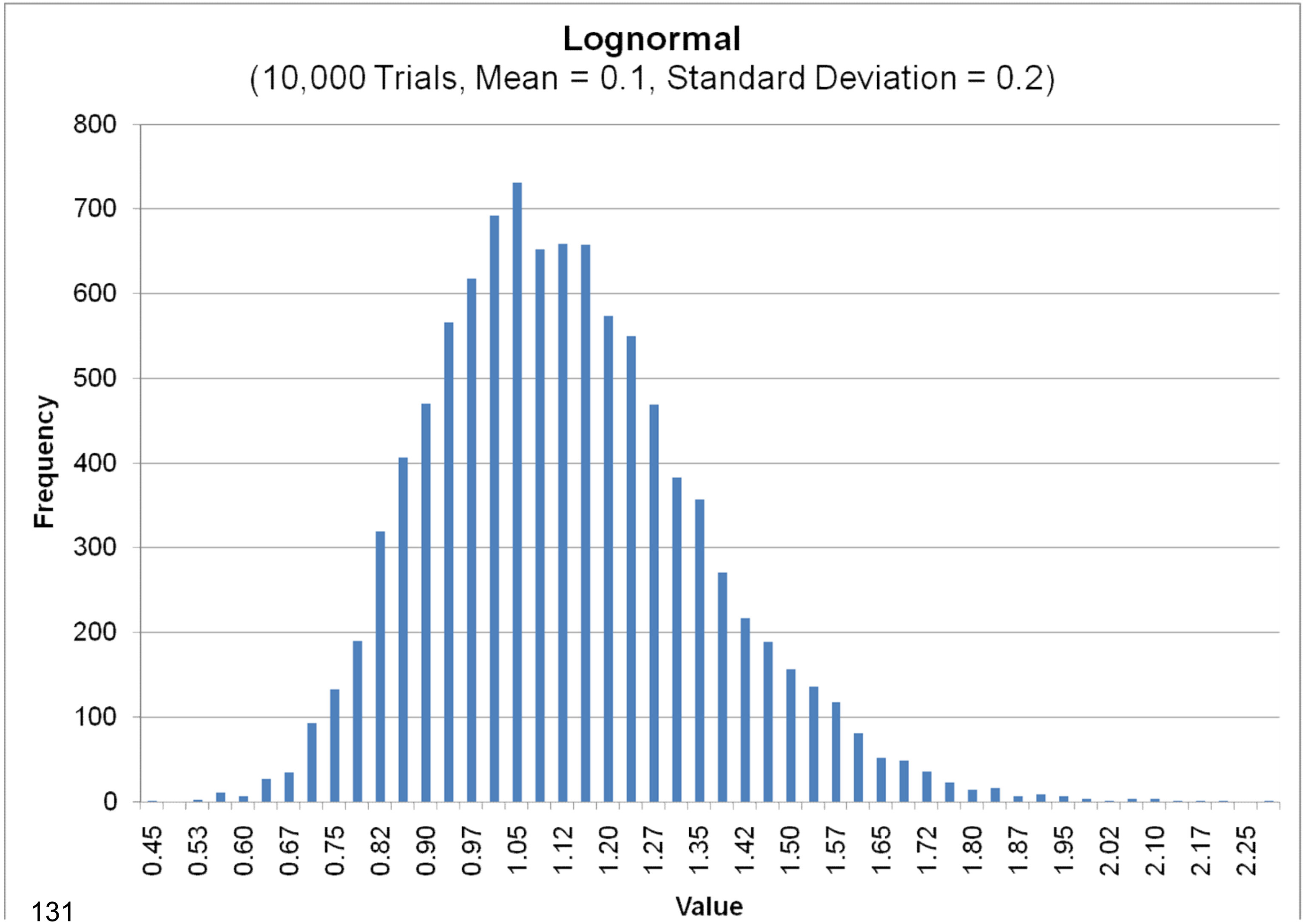
- Discrete distributions
  - rolling a dice or flipping a coin

- Continuous distributions
  - normal
  - lognormal: non-zero problem
  - triangular: prevents extreme outliers
  - Poisson
  - exponential
  - binomial: yes-no processes

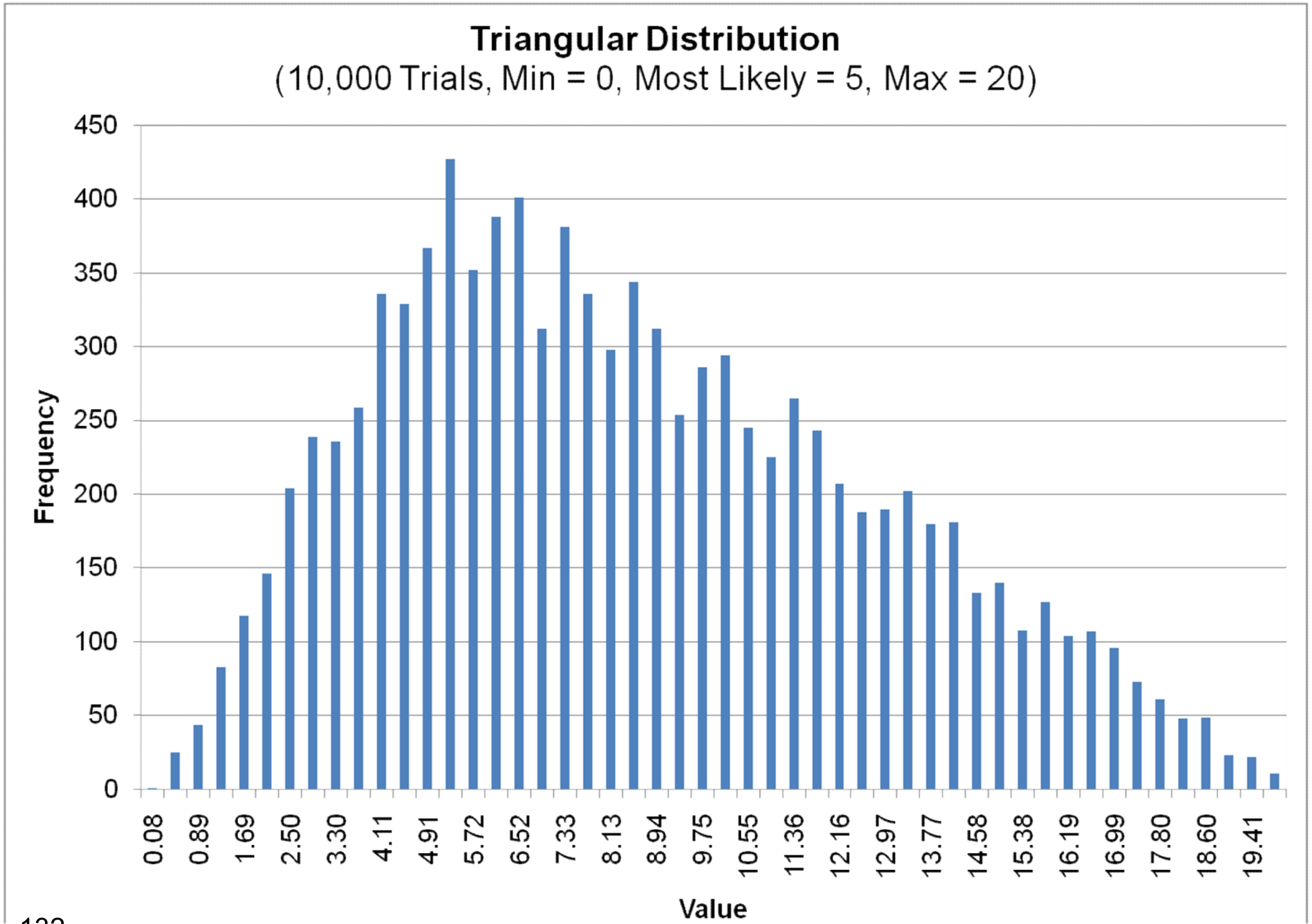
Describing risk



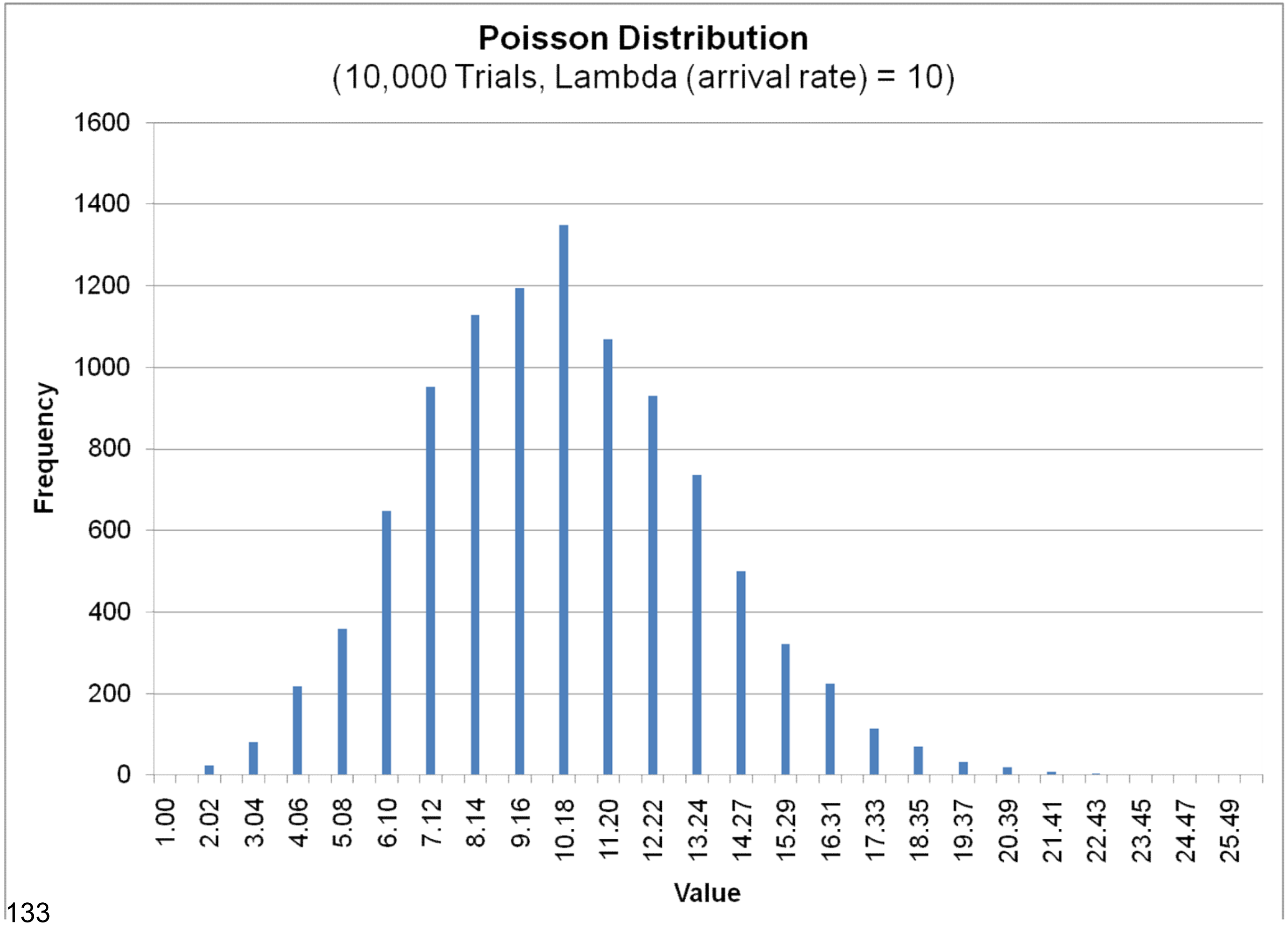
Describing risk



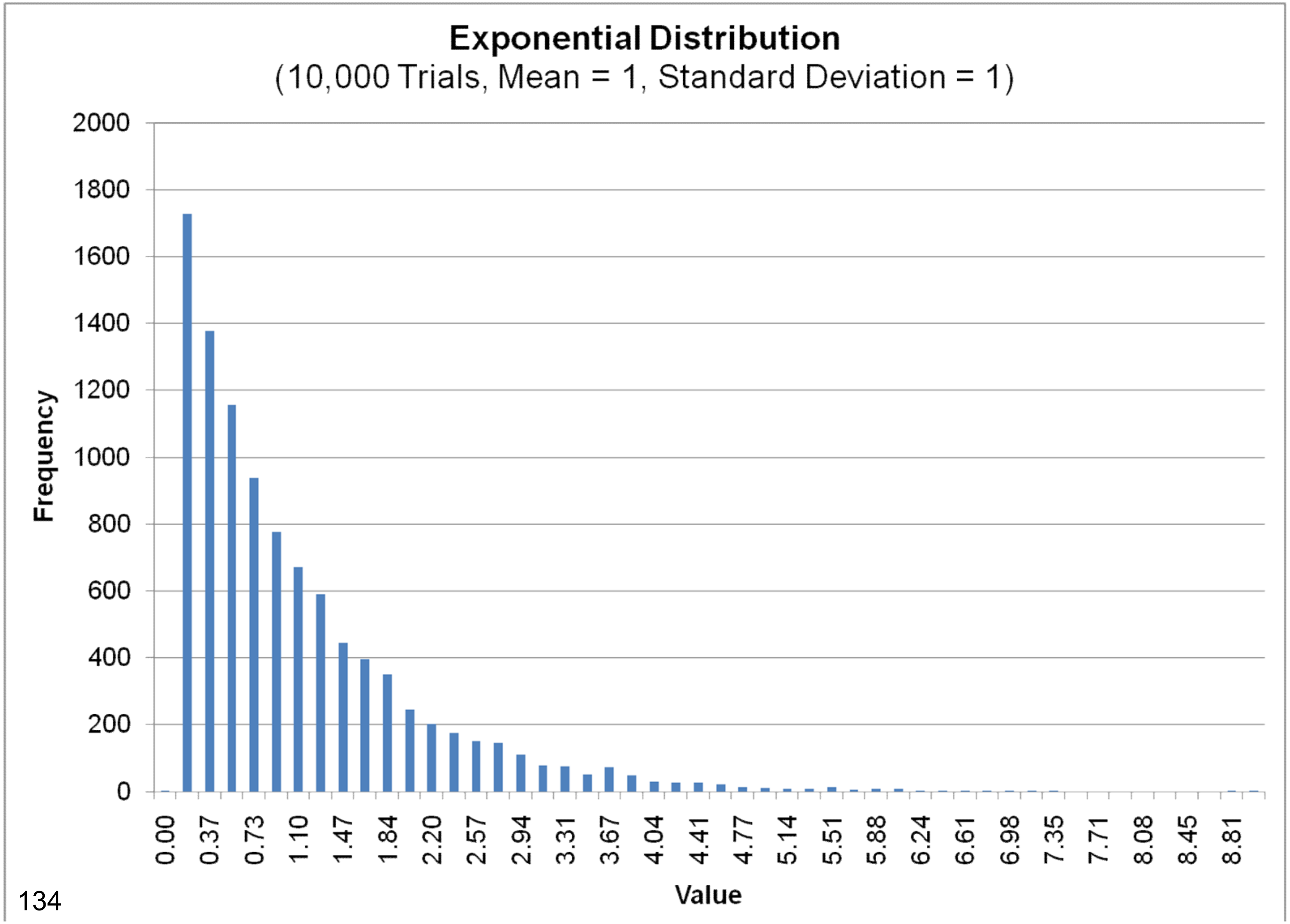
Describing risk



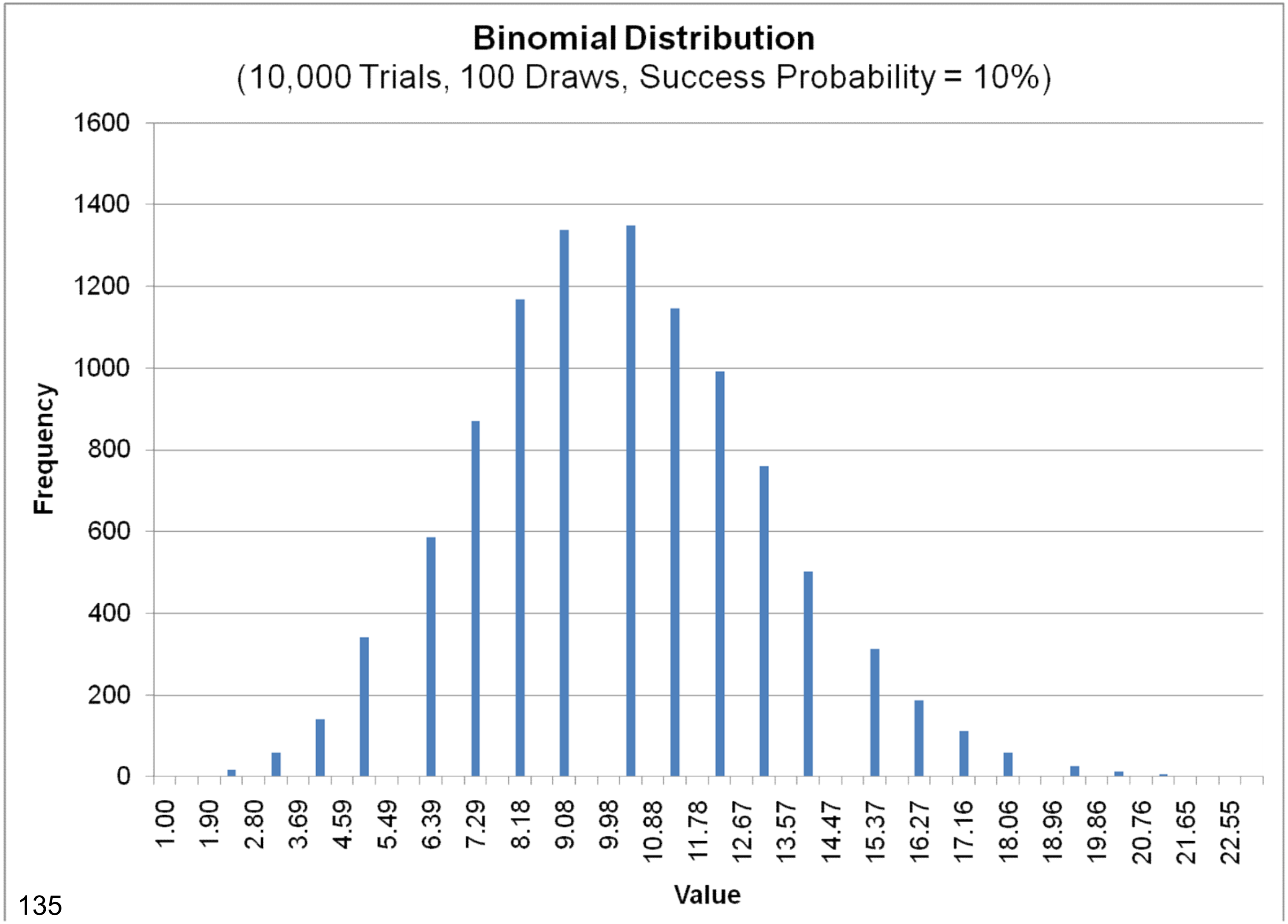
Describing risk



Describing risk



Describing risk



Evaluating strategic alternatives by simulation

- Step 1: Identify the strategies to be evaluated
- Step 2: Establish the criteria for evaluating the alternatives
- Step 3: Model the strategies to which simulation is applied
- Step 4: Specify the assumptions and uncertainties that influence value
- Step 5: Run the simulation
- Step 6: Analyze and evaluate the results

- We come back to the restaurant example to understand better how a simulation works

Step 1: Identification of strategic alternatives

- The normal practice is to compare simulation results that are generated from different models of the venture, where each model is designed to incorporate a particular set of strategic choices
  - Build a large restaurant
    - Without option to convert (abandon restaurant business)
    - With option to convert
  - Build a small restaurant
    - Without option to expand
    - With option to expand
    - Without option to convert to office
    - With option to convert
  - Do not invest
    - Without future consideration
    - With option to delay

Step 2: Determine evaluation criteria

- The choice of evaluation criteria depends on the nature of the business and the focus of the simulation. A simulation model must be designed to produce information relevant to the criteria against which alternative strategies will be judged
  - To serve as many clients as possible with a given resource base (not-for-profit)
  - To win as many legislative seats as possible (a political party)
  - To select the strategy that has the least potential of generating negative newspaper headlines (a public official)
  - To maximize shareholders value (a public corporation)
  - To maximize the value of the entrepreneur's interest in the venture (a small company)
  - To maximize the net present value of their own investments (outside investors)

Step 3: Construct a model of the strategic decisions – the large restaurant decision

- The appropriate risky discount rate (or rates) to be used by the entrepreneur is already determined and is implicit
- We begin by determining the present value of the restaurant as if it were owned entirely by the entrepreneur and then adjusting that value downward to reflect the fractional ownership interest of outside investors
- The present value of the restaurant can be stated in terms of present valued streams of cash flows (calculated with the very simply following formula – no corporate taxation):
  - PV cash flow = PV Revenues – PV cash Expenses
- To model the restaurant business, we need to specify the underlying determinants of revenues and cash expenses

Step 3: Construct a model of the strategic decisions – the large restaurant decision

- Revenue side
  - Price
  - Unit sales
    - Can be described as the product of total market size and the restaurant's potential market share.
    - We model unit sales to include a capacity constraint. If demand exceeds the constraint, then the constrained quantity is what is sold. Otherwise, sales volume depends on market demand
- Cost side
  - Variable cost expenses
  - Fixed cost expenses
- To determine the value of the restaurant to the entrepreneur, we need to know the fractional share of ownership that the entrepreneur retains. This depends on how much the outside investor contributes and how much equity the investor receives for the contribution

Step 3: Construct a model of the strategic decisions – the large restaurant decision

- The present value of entrepreneur's interest in the restaurant is the present value of cash flows minus the present value outside investor's interest
- The net present value of entrepreneur's interest in the restaurant is the present value of entrepreneur interest minus the entrepreneur's investment
- The outside investor's interest can be expressed as the present value of cash flows times the difference between total investment and the entrepreneur's investment time the per cent equity per dollar invested
- This model is not very complex. However, the returns from adding complexity diminish rapidly
- A parsimonious model that is focused on key relationship is likely to yield results that are just as useful as a model that is more complex

Step 3: Construct a model of the strategic decisions – the large restaurant decision

$$PV\ cash\ flow = PV\ revenues\ - PV\ cash\ expenses$$

$$PV\ revenues = PV\ unit\ price\ \times unit\ sales$$

$$Unit\ sales = lesser\ of\ demand\ quantity\ or\ capacity$$

$$Demand\ quantity = market\ size\ \times potential\ market\ size$$

$$Capacity = an\ assumed\ maximum\ value$$

$$PV\ cash\ expenses = PV\ unit\ cost\ \times unit\ sales + PV\ fixed\ cost$$

$$PV\ Entrepr.interest = PV\ cash\ flow\ - PV\ outside\ investor\ interest$$

$$\begin{aligned} &PV\ outside\ investor\ interest \\ &= PV\ cash\ flow \\ &\times (Total\ investment\ - entrepreneur\ investment) \\ &\times per\ cent\ equity\ per\ dollar\ invested \end{aligned}$$

$$NPV\ Entrepr.interest = PV\ entrepr.interest\ - entrepr.investment$$

Step 3: Construct a model of the strategic decisions – the large restaurant decision

$$NPV\ Entrepreneur\ interest =$$

$$\left\{ \begin{array}{c} \left[\begin{array}{c} (PV\ unit\ price\ - PV\ unit\ cost)\ \times \\ \times\ min\{market\ size\ \times potential\ market\ size; capacity\} + \\ - PV\ fixed\ cost \end{array} \right] \times \\ \times \left[\begin{array}{c} 1 - (Total\ investment\ - entrepreneur\ investment) \times \\ \times\ per\ cent\ equity\ per\ dollar\ invested \end{array} \right] \end{array} \right\}$$

$$- Entrepreneur\ investment$$

Step 4: Specify assumptions and describe uncertainties

- For the simulation to work, each variable in the model must be specified as either an assumed value or mathematical expression, or an assumed statistical process that will generate a value
- **The model can only be as good as its assumptions**. They must be based on data, experience, or careful reasoning
- Each assumption must be defensible, especially if the model is to be shared with outside parties

Step 4: Specify assumptions and describe uncertainties

Variable	Assumption
PV Unit Price of a meal	Normal Distribution (μ = \$10, σ = \$1)
PV Unit Cost of a meal	Normal Distribution (μ = \$5, σ = \$0,6)
Market Size Estimate (after first year)	Triangular Distribution (6, 2,6, 1 million units)
Market Size	Normal Dist. (μ = Estimate, σ = 100.000)
Market Share Estimate (after first year)	Normal Distribution (μ = 10%, σ = 1%)
Market Share	Normal Distribution (μ = Estimate, σ = 0,3%)
Capacity (over the life of the restaurant)	500,000
PV Fixed Costs	Normal Dist. (μ = \$500.000, σ = \$50.000)
Total Investment	Normal Dist. (μ = \$750.000, σ = \$25.000)
Entrepreneur Investment	\$400.000
Percent Equity Per Dollar Invested	1% per \$10.000 of outside investment

The number of meals (market size) are calculated over the life of the restaurant. The actual size of the market is equal to the realization of the first year estimate plus a random error. The error is assumed to be normally distributed with a mean of zero and a standard deviation of 100.000 meals

Step 4: Specify assumptions and describe uncertainties

- The model allows uncertainty about both the level of fixed costs and the size of the total investment that is required to construct the restaurant
- Because the entrepreneur's investment is limited to $400.000, this make the amount of outside investment uncertain
- For the simulation model to be useful, it is important for the entrepreneur to give a lot of thought to the assumptions
- Breaking down the model more finely sometimes is useful, so variables that are easier to estimate can be substituted for those that are difficult to estimate directly
- In this simulation, we focus on five variables in the model: market size, unit sales, present value of the venture, the entrepreneur's ownership share, and the net present value to the entrepreneur

Microsoft Excel
97-2003 Worksheet

Step 5: Run the simulation

Unconditional Simulation Results

Trials 300

Venture.SIM

	Output	Average	Median	Standard Deviation	Skewness	Percentiles				
						Minimum	***25%***	***50%***	***75%***	***Maximum***
1	Market Size	3.217.592	3.125.748	1.030.772	0,3321	1.125.794	2.452.174	3.125.748	3.944.959	5.827.140
2	Unit Sales	318.658	305.911	103.264	0,2320	101.365	240.041	305.911	392.507	500.000
3	Total Present Value	1.085.056	1.003.019	662.507	0,6682	(325.430)	598.105	1.003.019	1.460.043	3.232.787
4	Entrepreneur's Share	65%	65%	2%	(0,3826)	57%	64%	65%	67%	71%
5	NPValue to Entrepreneur	304.522	252.092	427.485	0,6360	(608.649)	(8.162)	252.092	553.485	1.609.254

- In the figure above we can see a table of simulation statistics for these variables based on running 300 iterations of the model
- Each time the model is run, the computer makes a random draw from each of the distributions that describe the uncertainty of the variables in the model.
- Simulation differs from sensitivity analysis by allowing us to examine the net effects of changing a number of variables at the same time

Step 5: Run the simulation

- The expected net present value of the venture for the entrepreneur is to be $304.522
- This is the average of the NPV's to the entrepreneur from 300 iterations of the model
- Based on the individual results, there is about a 25% chance that the venture will be a net loser (in net present value terms) for the entrepreneur
- The minimum value is lover than 400.000$, and it means that there is a small chance that the entrepreneur will lose more than the initial investment
- The expected ownership share of the entrepreneur is 65% with a range of 57% to 71%: the entrepreneur always ends up with a controlling interest
- To simulate market size, at first a draw is made from a triangular distribution, and then a normally distributed random error is added to that to find the "true" size of the market

Step 5: Run the simulation (2011)

Unconditional Simulation Results

Trials = 5000

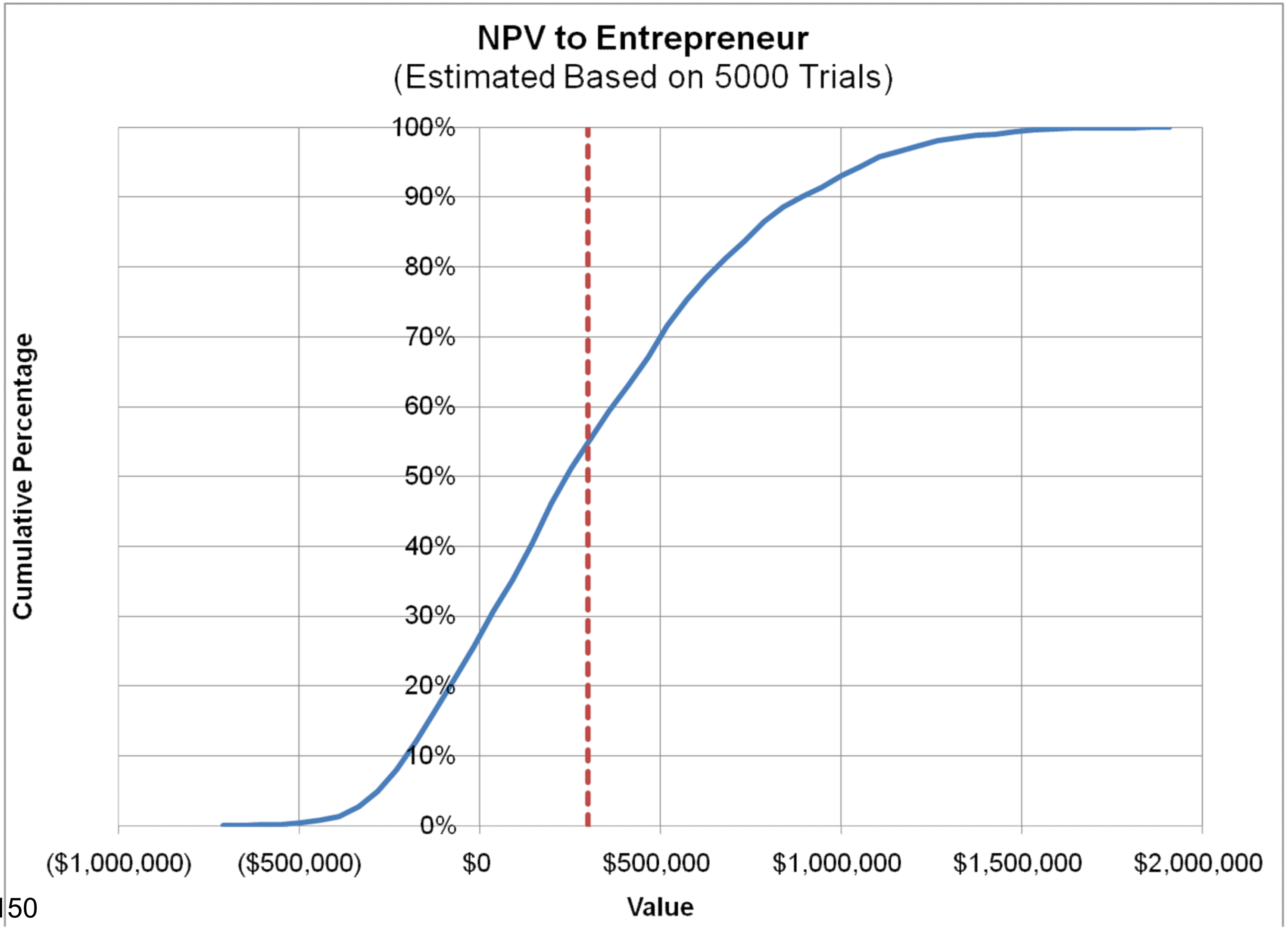
Venture.SIM

	Output	Average	Median	Standard Deviation	Skewness	Percentiles: Minimum	25%	50%	75%	Maximum
1	Market Size	3.212.694	3.065.070	1.054.064	0,303	908.109	2.415.842	3.065.070	4.045.972	5.977.817
2	Unit Sales (Lifetime)	316.821	301.949	104.730	0,189	78.866	235.401	301.949	401.659	500.000
3	Total Present Value	1.079.180	986.546	647.450	0,557	(469.267)	577.137	986.546	1.498.539	3.415.528
4	Entrepreneur's Ownership Share	0,649	0,649	0,026	0,061	0,562	0,630	0,649	0,666	0,740
5	Entrepreneur's NPV	299.515	238.803	419.340	0,555	(710.893)	(23.065)	238.803	567.702	1.908.014

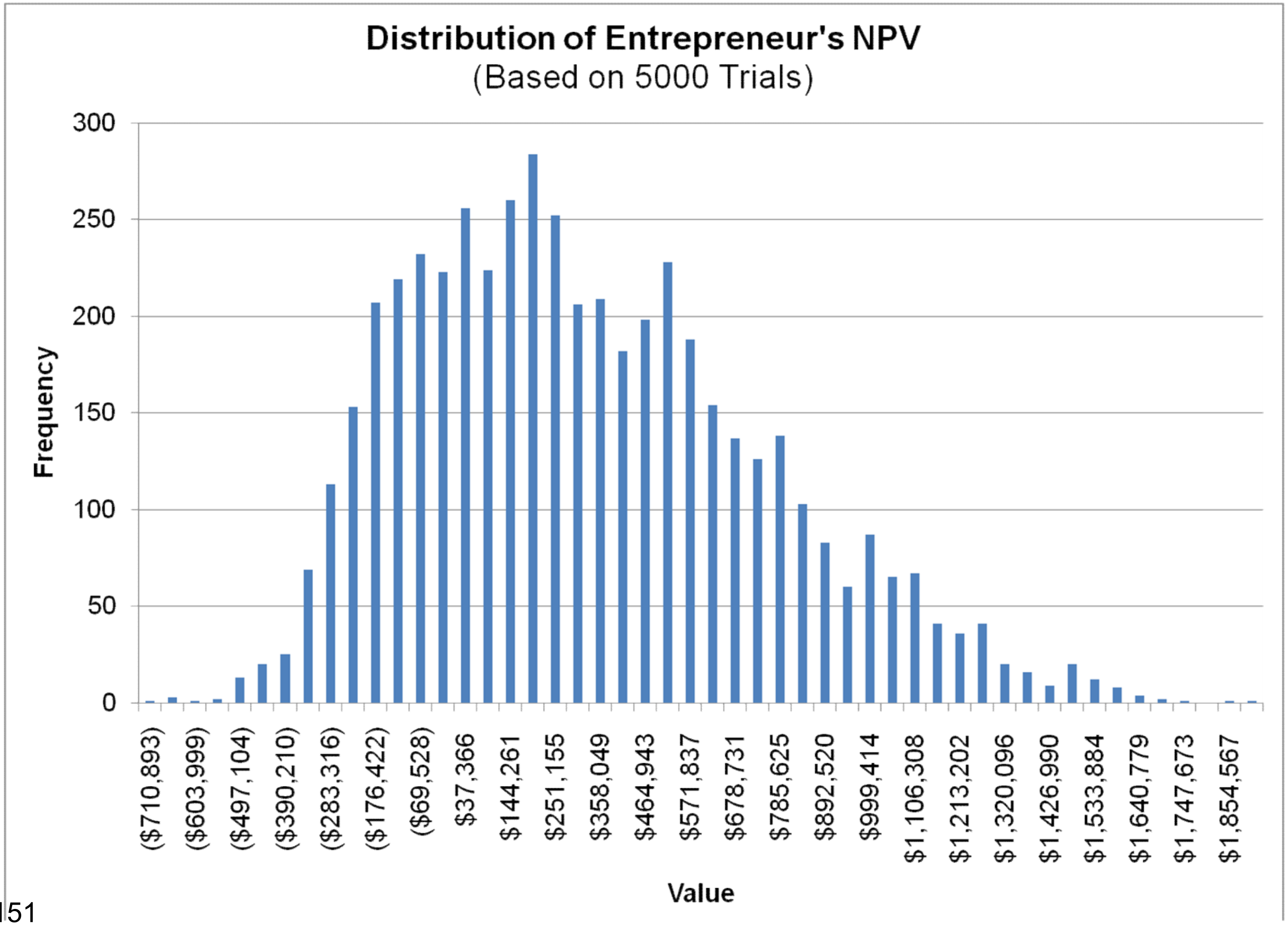
The standard error equals the standard deviation of the entrepreneur's NPV divided by the square root of the number of the iterations

Standard error = 419,340 / (5000^(0,5)) = 5,930

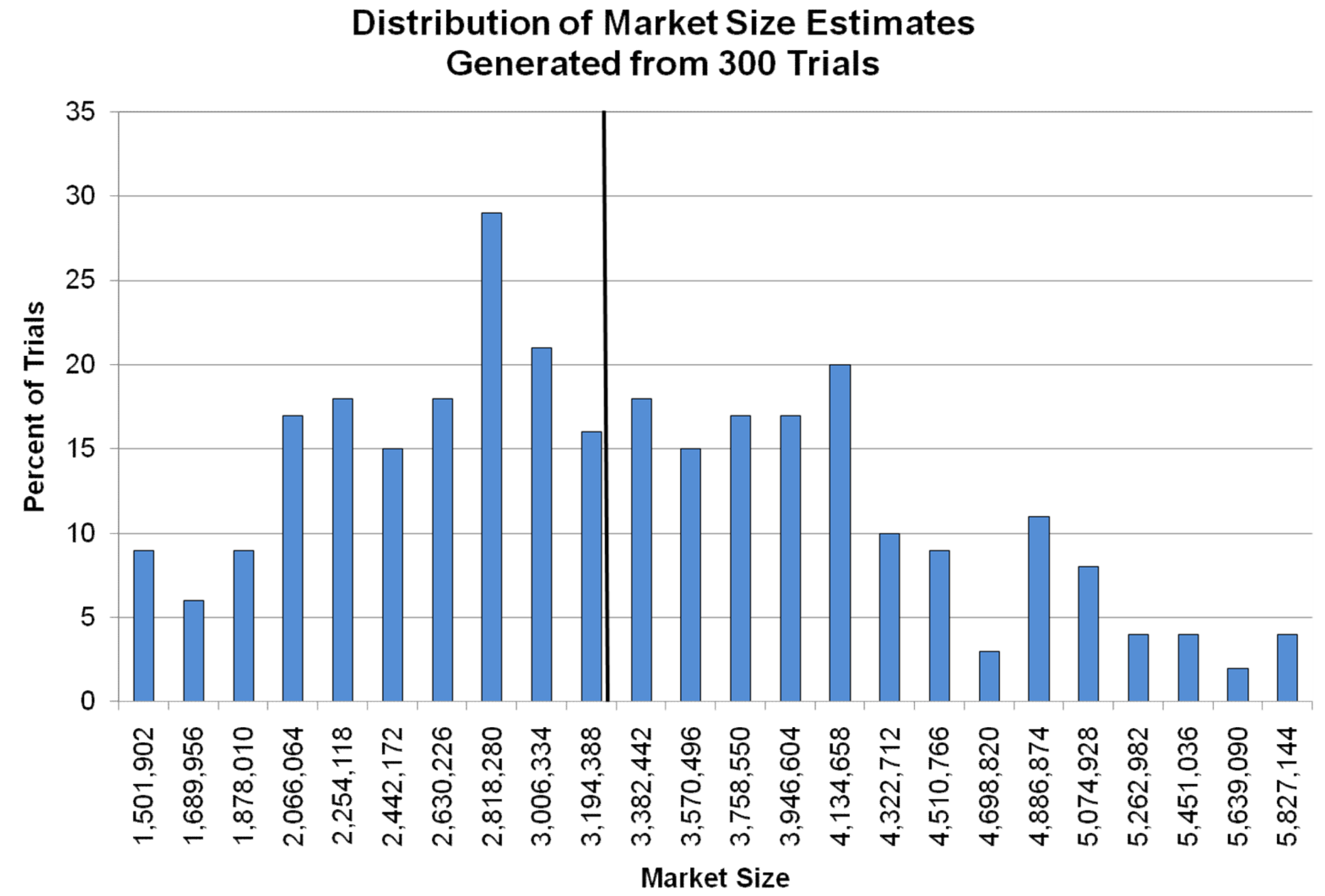
Step 5: Run the simulation (2011)



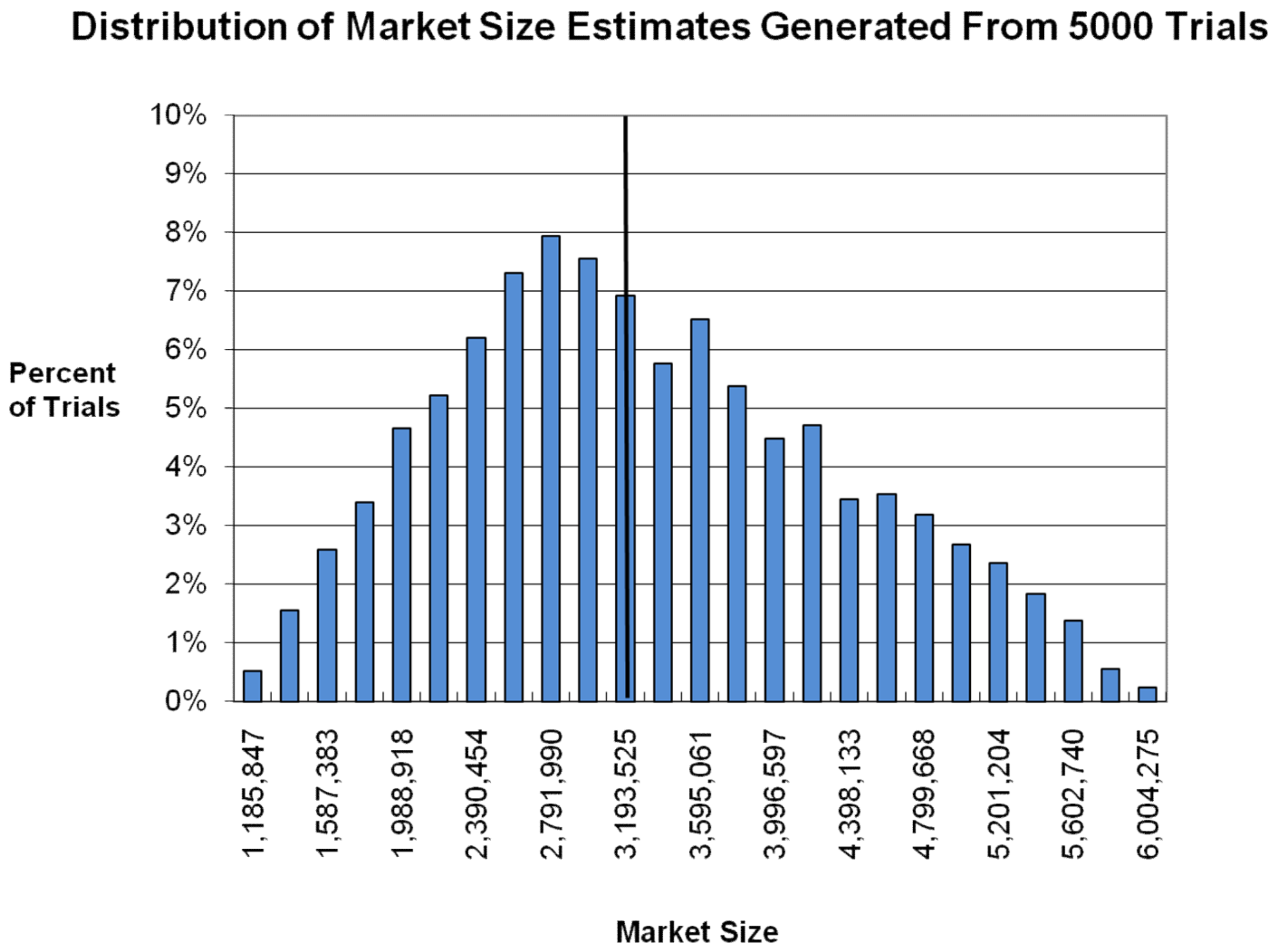
Step 5: Run the simulation (2011)



Step 5: Run the simulation (2003)



Step 5: Run the simulation (2011)



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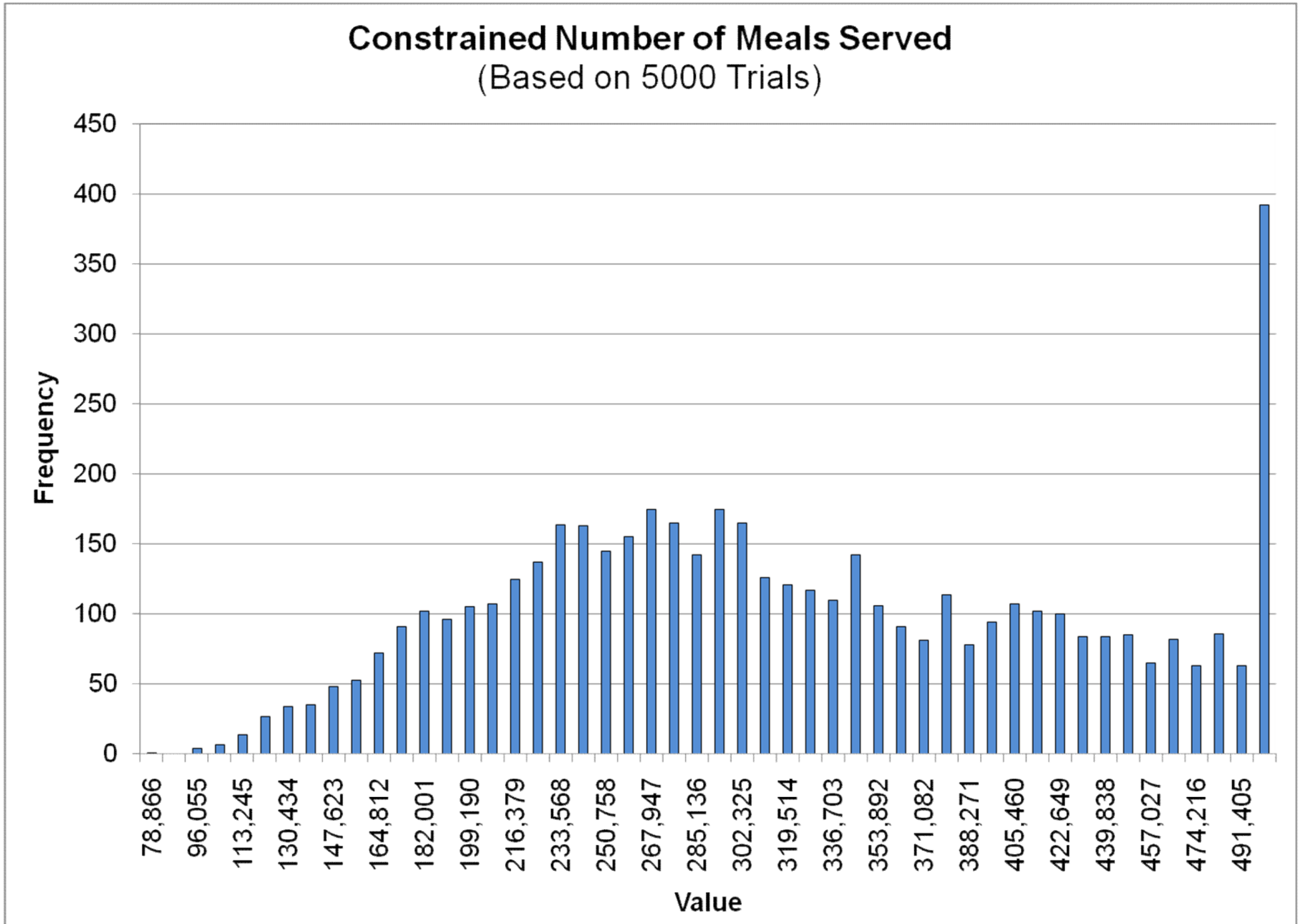
Step 5: Run the simulation (2011)



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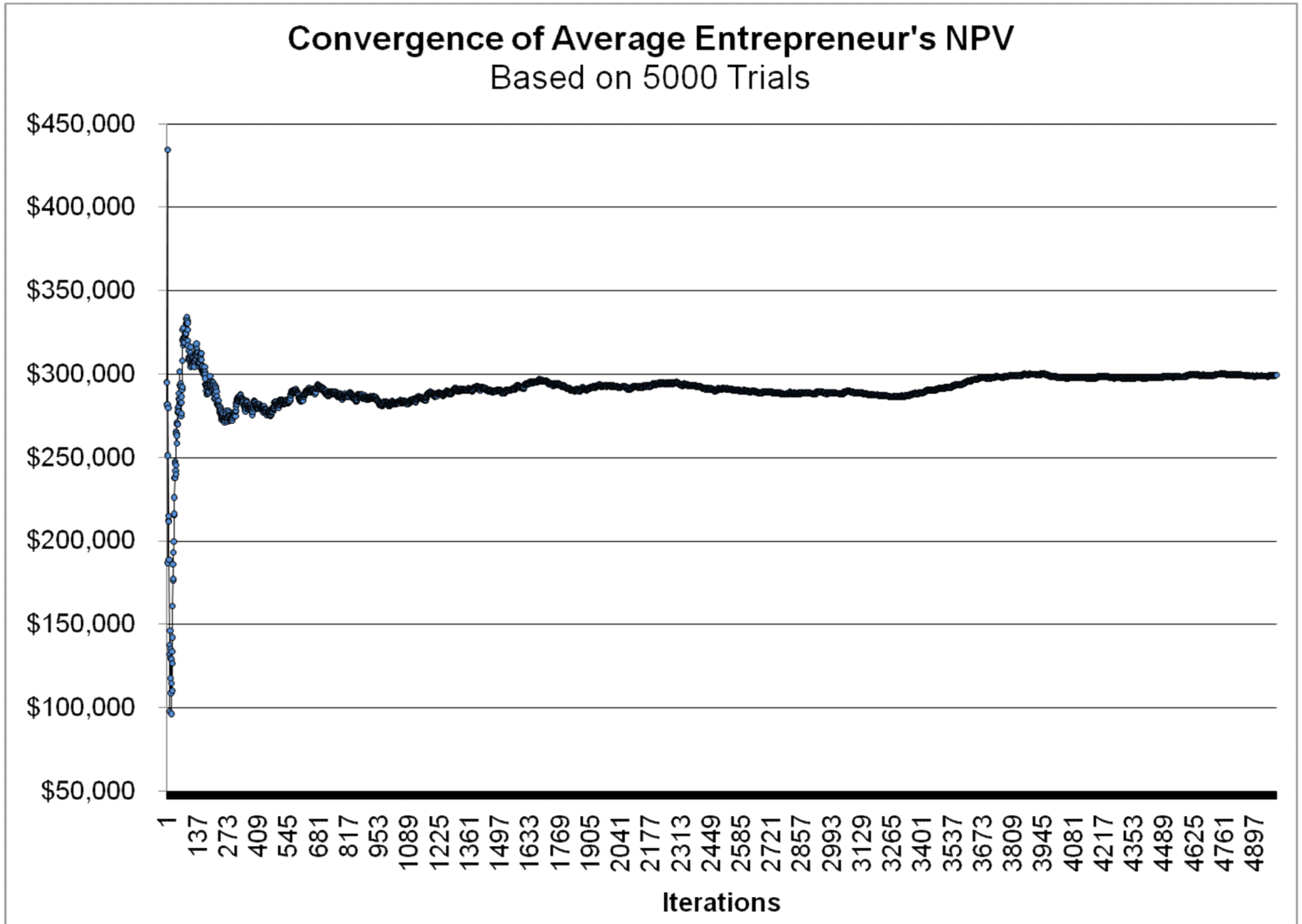
Step 5: Run the simulation (2011)



The restaurant example: results

Summary of large restaurant simulation

- average value of the restaurant is $1.08 million
- entrepreneur's average ownership is 65% (minimum is 56%)
- entrepreneur's average NPV $299,515 and NPV is positive in 73% of the trials
- 95% confidence interval is $287,700 to $311,300
- capacity constraint is binding in 8% of the trials

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Step 6: Analyze and evaluate the results

- The final step is to use the results of the simulation as a basis for making a decision
- Many times entrepreneurs have to compare several different alternatives and real decisions may require that inferences be drawn about alternative scenarios that have not been formally analysed
- For such decisions, it may be necessary to develop several simulation models with alternative assumptions and to compare the results of the different simulations

Comparing strategic choices with simulation

- For the restaurant venture we considered different possibilities:
  - Build the large restaurant immediately
  - Build a small restaurant immediately
  - Wait for more information on demand and built whichever size is appropriate, in light of that information
  - Build the small restaurant now, and expand if demand is sufficient
  - Build the large restaurant now and abandon it if demand is insufficient
  - Build the small restaurant now and abandon it if demand is insufficient
  - More complex alternative scenarios can be added that combine the options to wait, expand, and abandon

Comparing strategic choices with simulation

- We can use simulation to evaluate and compare the different previously listed possibilities
- With a simulation model that covers several years, we could estimate the value of a complex abandonment option that would give the entrepreneur the option to abandon at the end of each year
  - If the option is exercised, that is the end of the process
  - If not, the option for that year expires, but options to abandon in the future continue to exert a positive influence on the value of the business

Comparing strategic choices: small restaurant

- Assumptions changes
  - PV of fixed costs: μ = \$400,000, σ = \$40,000
  - capacity falls to 260,000
  - total investment: μ = \$600,000, σ = \$20,000
- Entrepreneur's average ownership is 80% (minimum is 73%)
- Entrepreneur's expected NPV = \$249,606
- NPV is positive in 82.7% of the trials
- Capacity constraint binds in 67.5% of the trials

<u>Conclusion: Large restaurant is the better choice</u>

Comparing strategic choices

The option to abandon – Large restaurant

- Assumptions
  - building has alternative use as office space
  - value as office space is \$600,000
  - conversion choice represents a put option
  - if PV < \$600,000, abandon restaurant and take \$600,000
- Expected NPV to entrepreneur = \$331,455
- Option value = (\$331,455 - \$299,515) = \$31,940

Comparing strategic choices

<u>The option to abandon – Small restaurant</u>

- Assumptions
  - value as office space is $300,000
  - if PV < $300,000, abandon restaurant and take $300,000
- Expected NPV to entrepreneur = $255,344
- Option value = ($255,344 - $249,606) = $5,738
- Option value is low due to
  - low probability of exercise (PV < $300,000)
  - smaller value for alternative use

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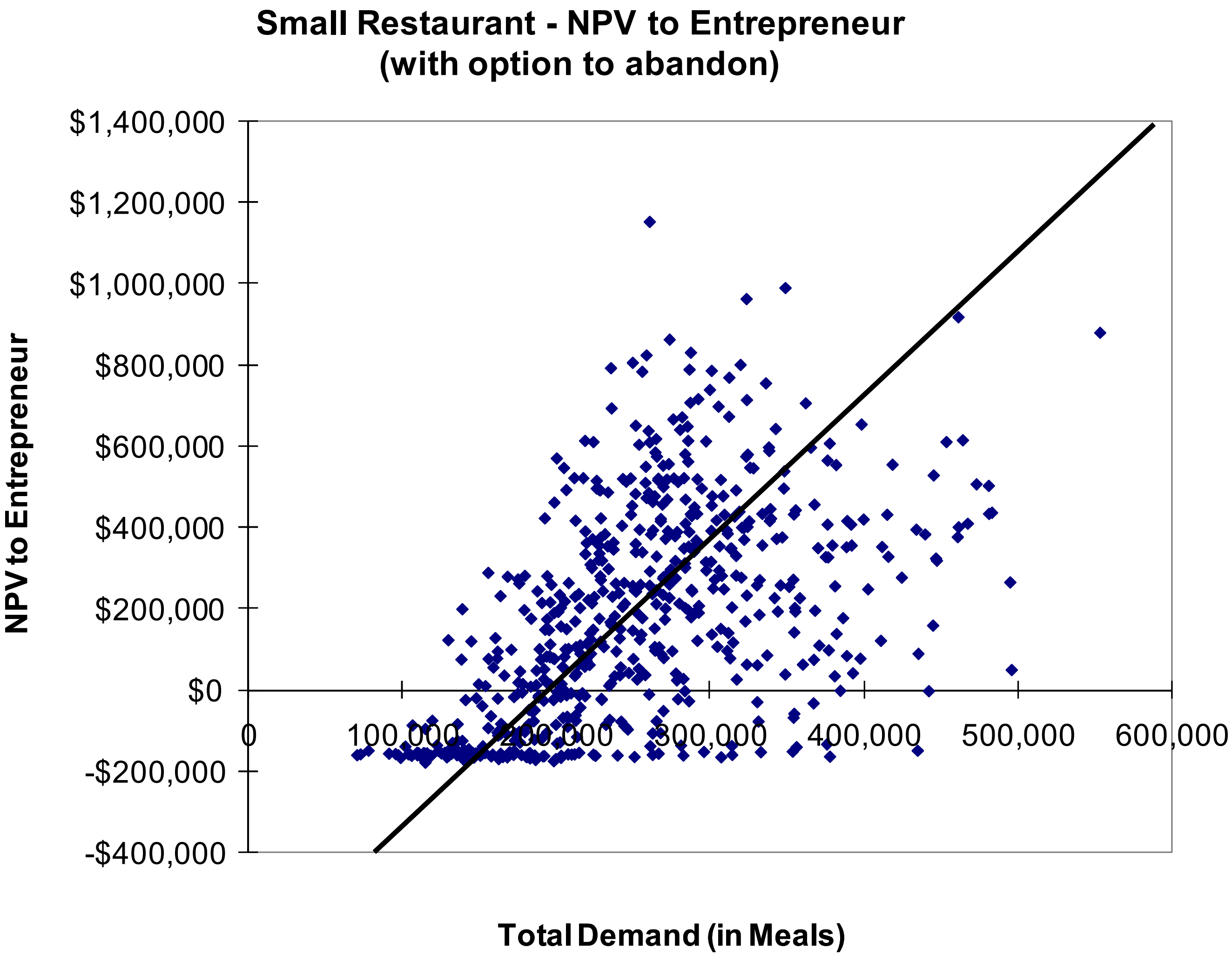
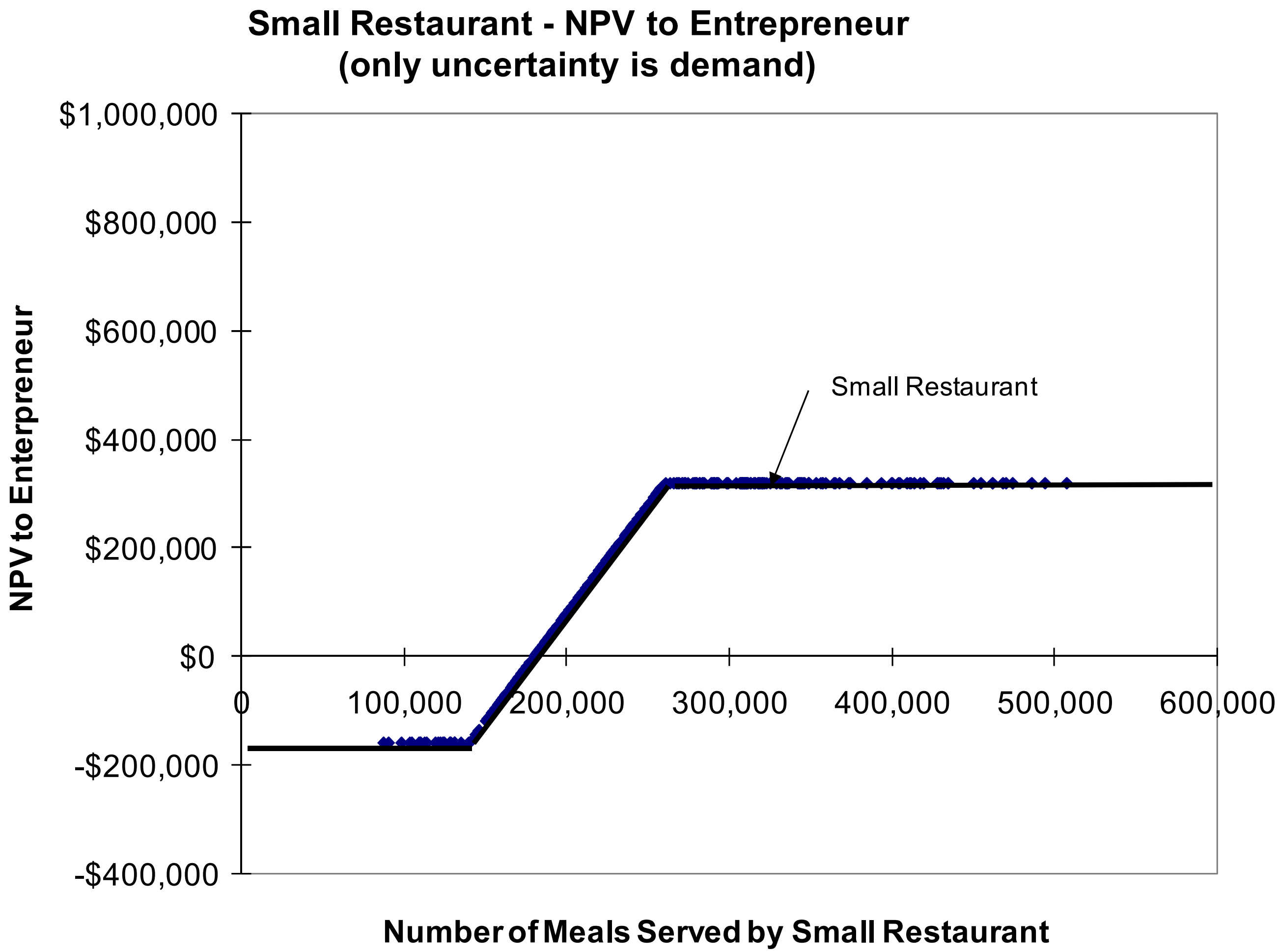
Comparing strategic choices



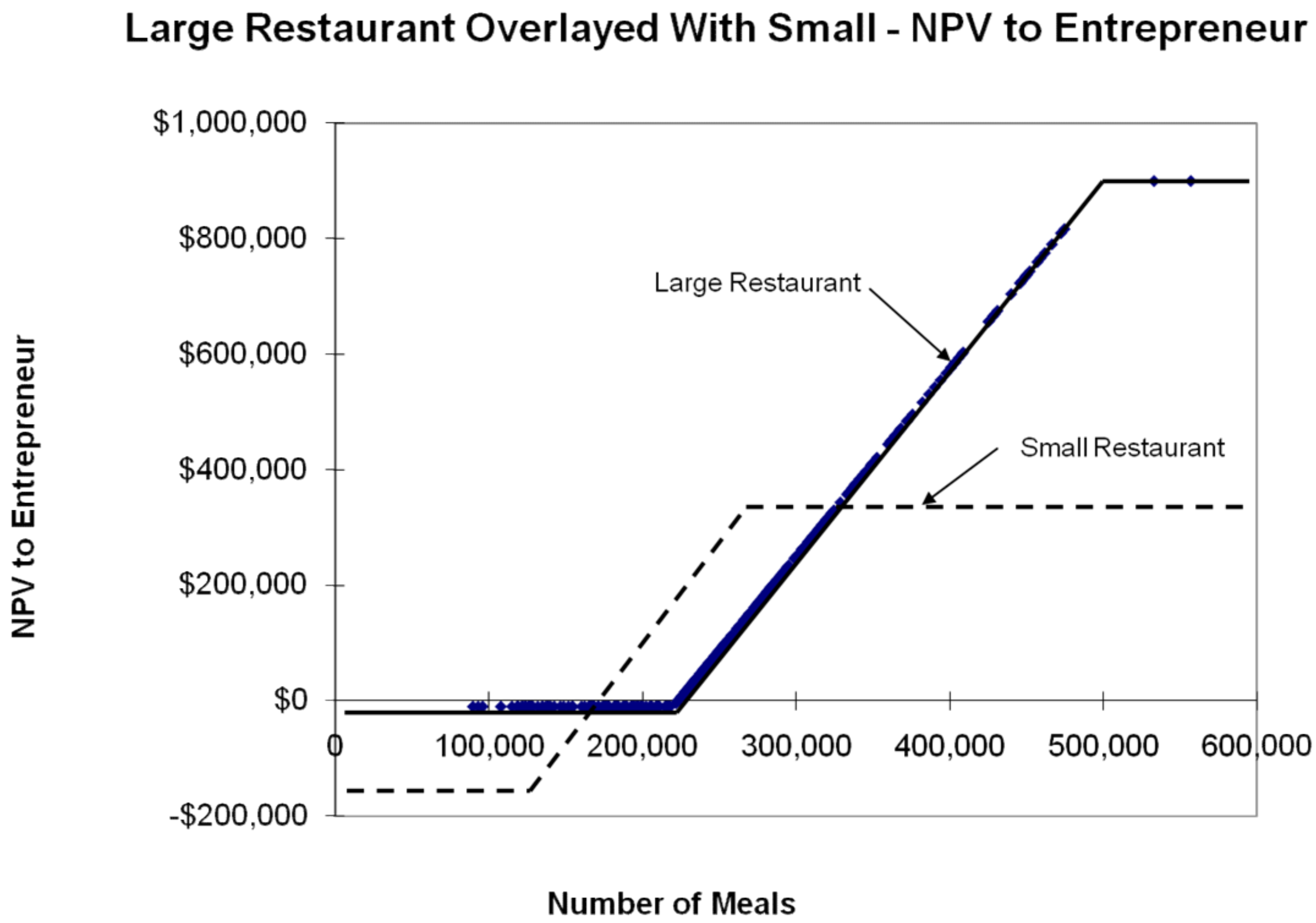
Comparing strategic choices



Comparing Strategic Choices

- Small restaurant – NPV to entrepreneur figure contains:
  - an underlying asset (the entrepreneur's claim on the restaurant)
  - a put option to abandon the venture for $300,000 that is exercised if demand is low
  - a call option the entrepreneur has "sold" by not building a restaurant large enough to handle high demand
- The upward-sloping portion is the entrepreneur's long position in the market demand for meals

Comparing strategic choices



The figure shows the combined effects of capacity constraints and abandonment options for the large and small restaurant, leaving out the other sources of uncertainty

Small restaurant - NPV to entrepreneur

- The figure shows the sample distribution of the entrepreneur's NPV from 600 iterations of the simulation model for investing in the small restaurant
- The effect of the abandonment option is reflected in the figure by the lower bound of negative NPVs
- Now we remove all of the uncertainty about prices and costs by using the mean values of those distributions, so that the only random variable is the level of demand
- If we compare the large restaurant to the small one, the large restaurant is more valuable to the entrepreneur that the small one if demand for meals turn out to be low
- As long as we know the true demand and can strip away the uncertainties about other factors like prices and costs, it is obvious which of the two restaurants should be built. Unfortunately we do not know these elements

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Comparing strategic choices

- Small vs. large restaurant and demand
  - at low demand levels (< 175,000 meals) the large restaurant is more valuable to the entrepreneur
    - larger abandonment value offsets higher initial cost
  - between 175,000 and 300,000 meals the small restaurant is more valuable due to lower costs
  - above 300,000 meals, the extra capacity of the large restaurant makes it more valuable to the entrepreneur than the small one
- Simulation does not remove uncertainty, but can highlight its impact on venture value

Comparing strategic choices

- Option to wait and learn
  - waiting gets the entrepreneur a preliminary demand estimate
    - increases likelihood of competitive entry and lower market share
    - reduces the PV of future cash flows
  - entrepreneur estimates NPVs of small and large
    - decision to build large, build small, or don't build
  - actual demand is realized
  - entrepreneur estimates NPV based on actual demand
    - decision to continue or abandon

Comparing strategic choices

- Option to wait and learn
  - expected NPV of entrepreneur's interest = $306,409
  - expected NPV of build large now with option to abandon = $331,455
  - option to delay is worth $25,046 less due to the lost market share

Comparing strategic choices

- Option to expand
  - represents a call option on additional capacity with a \$200,000 exercise price (the cost to add capacity)
  - the \$200,000 expansion cost comes from the investor (lower risk ⇒ less equity per \$1 invested)
- Expansion only makes sense if demand >300,000
  - expected NPV of entrepreneur's interest = \$432,000
  - expected NPV of build large now = \$331,455

    ⇒ expansion option creates \$100,000 of value
    - avoids higher cost of large restaurant when demand is low
    - lower uncertainty ⇒ smaller equity stake to investor

Developing business strategy using simulation - Summary

- Simulation has many applications in new ventures
- Simulation can incorporate uncertainty about
  - the venture
  - the environment
  - rival reaction
- Describing risk with probability distributions
- Simulation can be used to compare strategic choices

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Chapter 6

METHODS OF FINANCIAL FORECASTING

Benefits of financial forecasting

- Many entrepreneur of profitable and rapidly growing ventures are puzzled that they never seem to have enough cash to finance ongoing operations
- Financial forecasting is a critical element of the planning both for new businesses and those already developed
- The principal benefits of a good financial forecast are:
  - Financial forecasting is a disciplined way to evaluate how much cash the business is likely to require and how much might be required if the venture develops at a different rate then expected
  - Financial forecasting provides a basis for estimating the value of the venture so that an objective comparison can be made between the value of pursuing the venture and the value of the entrepreneur’s other opportunities

Benefits of financial forecasting

- Financial forecasting helps the entrepreneur compare strategic alternatives and select the one with the highest expected value
- If outside capital is required, financial forecasting helps prospective investors perceive the merits of the venture and helps the entrepreneur negotiate an appropriate financial interest
- A financial forecast can be used as a benchmark against which to compare actual performance, thereby providing early warning if the venture is not developing as expected
- Forecasting helps the entrepreneur and investors to understand the strengths and weaknesses of the venture

General rules of financial forecasting

- Build and support a schedule of assumptions
- Begin with a forecast of sales
- In forecasting sales, consider forecasting in real terms if sales growth is expected to track the inflation rate
- If using historical data to forecast for an established firm, consider a weighting scheme that puts more weight on the firm's most recent experience
- If forecasting for a new venture, identify several yardstick firms that can be used to develop underlying assumptions regarding expected performance
- Integrate, by way of formulas, the pro forma balance sheet, income statement and cash flow variables
- The time interval of the forecast (month, quarter, etc.) depends on the planning horizon. For new ventures, a monthly interval is usually a good choice

General rules of financial forecasting

- The time span covered by the forecast depends on how the forecast is to be used. If used for assessing financial needs, the time span should cover the period until the firm is expected to attract follow-on financing. If used to determining the value of the venture, the time span should take the venture to the point of harvesting
- Test the reasonableness of the model by thinking through the relations among line items across financial statements
- Try a basic «what if» analysis to see if the results are consistent with theory. For example, if cash sales growth is reduced and accounts receivables falls, then cash needs should fall. Ask yourself whether the magnitudes of the changes make sense
- Try a basic sensitivity analysis to make sure that the model yields reasonable results when magnitudes and growth rates or key variables change

Forecasting the sales of an existing business

- The forecast can be based on the existing track record of the business
- Some elements that must be considered:
  - Forecasting in levels or changes
    - Example: number of pieces times average prices
    - Example: sales at time 0 times a certain growth rate
  - Forecasting in real or nominal terms
  - Weighting of historical data
    - Example: sales will growth at the average rate of the previous five years
    - Example: sales will growth following the trend in the rate of sales growth in the previous five years
  - Forecasting based on underlying factors for which forecasts exist
    - Example: Economic and demographic factors

Forecasting the sales of an existing business

- Suppose that for an existing business we observe the following levels of sales and macro-economic information for the previous six years:

Year	-6	-5	-4	-3	-2	-1
Sales ($ millions)	2,0	2,4	2,7	2,6	2,6	2,9
Sales growth		+20%	+12,5%	-3,7%	0%	+11,5%
Inflation		+3%	+6%	+7%	+4%	+2%
Change in real GDP		+3%	+1,5%	-1%	-1%	+2%

Simple average sales growth = 8,06%
Range = -3,7% to 20%

Forecasting the sales of an existing business

- One approach to forecasting sales is to extrapolate the average historical growth rate
  - The simple average of the five sales growth rate is 8,06%
  - The high degree of uncertainty about the rate in any given year can be problematic, particularly if management is deciding on questions such as how much financing to arrange to cover the next year of operations
  - One way to improve the sales forecast may be to make it in real (inflation adjusted) terms, especially if price increases for the venture track the inflation index and if inflation forecast are available publicly

Forecasting in real terms

Year	-6	-5	-4	-3	-2	-1
Sales ($ millions)	2,0	2,4	2,7	2,6	2,6	2,9
Sales growth		+20%	+12,5%	-3,7%	0%	+11,5%
Inflation		+3%	+6%	+7%	+4%	+2%
Real sales growth		+16,5%	+6,1%	-10%	-3,8%	+9,3%

Average sales growth = 3,62%
Range = -3,8% to 16,5%

- The range in real terms is similar to the range in nominal terms
- A reasonable forecast of growth may be achieved by using historical nominal growth rates, assuming that expected future inflation is the average of past inflation rates
- Alternatively, it may be more accurate to add the historical average real growth rate to a current forecast of inflation

An example

- Publicly available forecasts for next year are for an inflation rate around 1%
- If we forecast sales growth adding inflation rate to the average real growth, we obtain 4,62%
- If we forecast sales growth using nominal growth rate, we obtain 8,06%, no matter what the rate of inflation is expected to be
- If the product price tends to follow the inflation rate, then a forecast based on expected inflation is likely to be better than simple trend exploration
- If you prefer to generate sales forecast in real terms, then when formulating the pro forma statement, it is better to take the inflation-adjusted sales numbers and express them in nominal terms again

Using weighting to improve a forecast

- Another technique for improving forecast accuracy is to weight the historical observations of sales growth so that the more recent experience receives greater weight
- The general point is that the future probably will be more like the recent past than the more distant past
- In the example we can use a simple judgmental approach of applying a weight factor of 5/15 to the real growth rate of sales in the most recent year, 4/15 to the prior year, and so on

Year	-6	-5	-4	-3	-2	-1
Real sales growth		+16,5%	+6,1%	-10%	-3,8%	+9,3%
Weight factor		1/15	2/15	3/15	4/15	5/15
Weighted growth		1,10%	0,81%	-2,00%	-1,01%	3,10%

Weighted average real sales growth = 2,00%

Using exponential smoothing

$$Forecast_{T+1} = \alpha \times Actual_T + (1 - \alpha) \times Forecast_T$$

- α is a weighting factor between zero and one
- Implicitly reflects data from before Year T

Year	-5	-4	-3	-2	-1	
Real sales growth	+17,0%	+6,5%	-10,7%	-4,0%	+9,5%	
Forecast with α = 0,2		+17,0%	+14,9%	+9,8%	+7,0%	+7,5%
Forecast with α = 0,6		+17,0%	+10,7%	-2,1%	-3,3%	+4,4%

- When the equation is used the weights applied to earlier results decrease exponentially
- With α set at 0,20

$$Forecast_{T+1} = \alpha \times Actual_T + (1 - \alpha) \times Forecast_T$$
$$= 0{,}2 \times 9{,}5\% + 0{,}8 \times 7{,}0\% = 7{,}5\%$$

Using regression analysis to forecast

- We could generate a more accurate forecast by trying to identify the economic factors that affect the level of sales
- These forces might be macroeconomic variables such as the growth rate of gross domestic product (GDP); they might be socioeconomic, such as the population growth rate or the average age of the population; or they could be industry-specific, such as industry sales growth rate, emergence of new competitors, or product innovations
- Using a computer is possible to examine the statistical relationship between sales growth and real GDP: in our example the real sales growth rate of the business is about five times as volatile as the GDP and that the two are highly correlated with each other
- Based on visual inspection of the relationship, the expected growth of sales that is generated by multiplying GDP by five is very close to the actual growth rate

Using regression analysis to forecast

Year	-6	-5	-4	-3	-2	-1
Change in real GDP		+3%	+1,5%	-1%	-1%	+2%
Expected sales growth (x5)		+15%	+7,5%	-5%	-5%	+10%
Real sales growth		+16,5%	+6,1%	-10%	-3,8%	+9,3%
Inflation		+1,5%	-1,4%	-5%	+1,2%	-0,7%

- Regression model:
  Expected real sales growth = 3,34% + 5,24 x change in real GDP
- This table shows that, once the historical growth rate of GDP is known, it is possible to estimate roughly the historical growth rate of sales
- It does not make sense to search arbitrarily for variables that appear to have been related to sales growth in the past
- It is important to think critically about the factors that are likely to influence sales growth, and then use past information to test the strength of the relationship

Key questions to be answered in a sales forecast

- For any given pattern of desired or expected future sales, we can work back to determine the cash flow from operations that are expected to be available for future investment
- Using estimates of the productivity of assets, in terms of their ability to support sales, we can also work back to determine expected external financing needs
- Four key questions must be answered in the sales forecast of a new venture:
  – When will the venture begin to generate revenue?
  – How rapidly will revenue grow?
  – Over what span of time (3 years, 5 years, 10 years, etc.) should the forecast be made?
  – What is an appropriate forecasting interval (weekly, monthly, annually, etc.)?

Forecasting sales of a new venture

- Developing sales forecast for a new venture is more difficult, and the result is likely to be much less certain
- Because the venture is new, there is no track record that can be used to develop the sales forecast
- In the textbook two approaches are suggested:
  - Yardstick
    - Comparable firms on some dimensions that are important for forecasting
    - IPO prospectuses (to measure revenues growth over a number of yrs.)
    - Other data sources
  - Fundamental analysis
    - Market and market share
    - Engineering cost estimates
    - Demand-side approach - How much customers would buy
    - Supply-side approach - How fast the venture can grow
    - Credibility and support for assumptions

Forecasting sales of a new venture – Yardstick approach

- A yardstick is an established firm that is comparable to the entrepreneur's venture in some important dimensions but not necessarily all dimensions
- Comparability can be evaluated by considering factors such as:
  - The expected market for the product
  - Distribution channels
  - Uniqueness of the product relative to existing substitute
  - Manufacturing technology
- Companies that make initial public offerings are ideal candidates for assessing optimistic but realistic sales growth potential
- In many cases, the offering prospectus of a public company contains enough historical data to measure sales growth over a number of years during which the company was private
- Each comparable firm can serve as a case study, providing insights to the financing choices the entrepreneur faces

Yardsticks: A simple example

- Entrepreneur is considering launching a coffee shop, Morebucks, and collects the following data:

Company	*Year*	*No. of shops owned*	*Revenue ($million)*	*Revenue/shop ($)*
Coffee People, Inc.[a]	1997	31	27.7[a]	893,500
Diedrich Coffee, Inc.	2008	5	4.4	880,000
Peet's Coffee & Tea, Inc.	2008	188	187.7	998,400
Starbucks, Inc.	2008	7,238[b]	6,997.7[b]	966,800

[a] *Coffee People, Inc. revenue adjusted to 2008 dollars using an inflation rate of 3 percent per year.*
[b] *Data are for US company-operated stores. All Peet's retail stores in the United States are company operated.*

- What is a reasonable forecast of Morebuck's revenue?
  - Based on the revenue-per-shop information for the yardstick companies, it seems unlikely that Morebucks, as a new coffee shop with a single store, could do better than even the smallest of the public companies

Yardsticks: A more challenging example

- New venture will integrate GPS, street maps, topographical data, and real-time air traffic information into a navigation system for general aviation
- No single comparable, but the following yardsticks have some similar dimensions
  - Navteq Corporation
  - Garmin Ltd.
  - GPS Industries, Inc.
- Information from these yardsticks can be used to synthesize a revenue forecast for the new venture

Aviation Navigation Yardstick Companies

Navteq Corporation

a leading developer and provider of a navigable database for use in route guidance products in the US and Europe

Founded	1987
IPO	1996
Acquired by Nokia	2007

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total Revenue ($000s)	1,855	2,486	3,673	5,268	8,678	26,844	51,088	82,195	110,431	165,849
Percent Growth		34.0%	47.7%	43.4%	64.7%	209.3%	90.3%	60.9%	34.4%	50.2%

Garmin Ltd.

a leading provider of navigation communications and information devices using GPS

Founded	1989
IPO	2000

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Revenue ($000s)	102,474	135,874	160,280	169,030	232,586	230,183	263,358	350,647	572,989	762,549
Percent Growth		32.6%	18.0%	5.5%	37.6%	-1.0%	14.4%	33.1%	63.4%	33.1%
Avionics Revenue ($000s)			38,255	33,584	63,422	115,558	105,761	114,470	120,552	171,526
Percent Growth				-12.2%	88.8%	82.2%	-8.5%	8.2%	5.3%	42.3%

GPS Industries, Inc.

GPS and Wi-Fi multimedia solutions for golf facilities

Founded	1999
Reverse merger	2000

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total Revenue ($000s)	0	0	0	0	0	2,184	5,818	6,576	7,266	13,490
Percent Growth							166.4%	13.0%	10.5%	85.7%

Forecasting sales of a new venture – Fundamental analysis

- Typically, the analysis starts with an estimate of the aggregate size of the relevant market
- Sales estimates for the venture can be generated either from:
  - the demand side
    - This approach tries to determine how much consumers in the market would be willing to buy from the venture, assuming the venture has adequate capacity to supply all of the demand
    - The demand side forecast begins with an estimate of the market share that the venture would be able to capture, depending on such demand related factors as number of competitors, pricing, location, and marketing effort
  - the supply side
    - This approach tries to determine how fast the venture can grow, given managerial, financial, and other resource constraints
    - The point is that, even if demand is expected to increase rapidly, the venture's growth rate may be limited on the supply side

Fundamental analysis: A simple example

- Morebucks entrepreneur researches two coffee shop locations and assembles the following data:

Comparable type	*Days per year*	*Hours per day*	*Customers per hour*	*Revenue per customer*	*Annual revenue*
Business/entertainment center	360	18	25	$6.00	$972,000
Business only	300	12	30	$4.50	$486,000

- Different locations ⇨ different revenues/costs ⇨
- Fundamental research might include:
  - direct observation
  - communication with
    - other coffee shop owners
    - real estate professionals
    - trade associations

Fundamental analysis: A more challenging example

- General aviation navigation system
- Data collected from the General Aviation Manufacturers Association (GAMA)
  - two segments: OEM and retrofit
  - historical data on sales growth rates
  - aircraft type and rate of adoption
- Forecasting OEM sales of navigation system is relatively easy because GAMA provides annual data on new aircraft manufactured in the US. Forecasting retrofit sales is more difficult because those sales depends on the size of the existing aircraft fleet than on annual production of new aircraft
- Selling price of $2,500. The entrepreneur's navigation product is designed for smaller and less expensive aircraft

Fundamental Analysis of General Aviation Market and Revenue Forecast

Panel (a) — General Aviation New Airplane Shipments by Type Mfd. in the US

		Fixed Wing					Estimate	
	Total	Piston	Multi-	Turbo			OEM	
Year	New	Single	Engine	Prop	Jet	Rotocraft	Market*	Growth
2004	2,952	1,706	52	194	403	597	1,933	
2005	3,619	2,024	71	240	522	762	2,311	19.56%
2006	4,007	2,208	79	256	604	860	2,525	9.26%
2007	4,384	2,097	77	290	815	1,105	2,489	-1.43%
2008	4,367	1,700	91	333	955	1,288	2,155	-13.42%
*Est. OEM Market = all Piston Single + 40% of Turboprop + 25% of rotocraft							Avg. Growth	3.49%

Panel (b) — US General Aviation Aircraft Fleet by Type and Year

		Fixed Wing					Total US
	Total	Piston	Multi-	Turbo			Estimate
Year	Fleet	Single	Engine	Prop	Jet	Rotocraft	Retrofit Mkt*
2004	190,580	146,613	18,469	8,379	9,298	7,821	151,920
2005	194,006	148,101	19,412	7,942	9,823	8,728	153,460
2006	191,345	145,036	18,708	8,063	10,379	9,159	150,551
2007	192,007	144,580	18,555	8,190	10,997	9,685	150,277
Forecast							
2008	193,120	144,220	18,385	8,300	12,000	10,215	150,094
2009	194,495	144,030	18,225	8,425	13,055	10,760	150,090
2010	196,155	144,015	18,055	8,565	14,220	11,300	150,266
2011	197,935	144,115	17,895	8,710	15,410	11,805	150,550
2012	199,765	144,325	17,725	8,855	16,590	12,270	150,935
2013	201,670	144,645	17,565	9,005	17,740	12,715	151,426
2014	203,595	145,075	17,410	9,155	18,805	13,150	152,025
2015	205,565	145,620	17,245	9,310	19,845	13,545	152,730
Forecast period CAGR:		0.14%	-0.91%	1.65%	7.45%	4.11%	0.25%

*Est. Retrofit Market = all Piston Single + 40% of Turboprop + 25% of rotocraft

Fundamental Analysis of General Aviation Market and Revenue Forecast

Panel (c) — Unit Sales and Revenue Forecast ($000)

Year	Est. OEM Market	Est. Mkt. Share	Est. OEM Sales	Est. Retro. Market	Est. Mkt. Share	Est. Retro. Sales	Total Units	Est. Revenue
2010	2,308	3%	58	150,266	1.0%	1,503	1,560	$ 3,901
2011	2,389	5%	119	150,550	2.0%	3,011	3,130	$ 7,826
2012	2,472	10%	247	150,935	3.0%	4,528	4,775	$ 11,938
2013	2,559	15%	384	151,426	2.0%	3,029	3,412	$ 8,531
2014	2,648	20%	530	152,025	1.0%	1,520	2,050	$ 5,125
2015	2,740	20%	548	152,730	1.0%	1,527	2,075	$ 5,188

- Totalling 2010 through 2015 gives the company a cumulative retrofit share of about 10%. Taking account of future product improvements, we assume that the retrofit share stabilizes at around 2% of the fleet per year
- The entrepreneur needs to be thinking about the combination of product features and price that will turn potential customers into buyers

Forecasting sales of a new venture – Fundamental determinants of sales revenue

- Demand-side considerations
  - What geographic market will the venture serve?
  - How many potential customers are in the market?
  - How rapidly is the market growing?
  - How much, in terms of quantity, is a typical customer expected to purchase during a forecast period?
  - How are purchase amounts likely to change in the future?
  - What is the expected average price of the venture's product?
  - How good is the venture's product compared to the products of competitors?
  - How aggressively and effectively, compared to competitors, will the venture promote its product?
  - How are the competitors likely to react to the venture?
  - Who else is considering entering the market, and how likely are they to do so?
  - In light of the above, what market share is the venture likely to be able to achieve?

Forecasting sales of a new venture – Fundamental determinants of sales revenue

- Supply-side considerations
  - How much can the venture effectively produce, market, and distribute, given its existing resources?
  - How rapidly can the venture add and integrate the resources that would be needed for expansion of output?

- Slow-growth scenarios normally are constrained by the limits of market demand, whereas rapid-growth scenarios normally are constrained by the organization's ability to manage growth
- Whether a forecast is based on yardsticks, fundamental analysis, or a combination of the two, it is important that projections be realistic and credible
- Fundamental analysis is subject to the greatest potential for wild speculation ⇨ Base the analysis on solid reasoning and well-supported and well-documented assumptions

Estimating uncertainty

- For a new or early stage venture, efforts to forecast sales and other results may seem of little value. But, for a venture with an uncertain future, the forecast of expected performance is simply a way to anchor a forecast of uncertainty
- Failure to assess the level of uncertainty can result in critical financing errors and/or in serious strategic errors
- One simple approach to forecast uncertainty is to generate a baseline trend for a variable of interest, such as sales, during an historical period, and then estimate uncertainty as the historical standard deviation of differences between actual and expected values
- For a venture that does not have a track record, it is possible to estimate uncertainty:
  - On the experience of other companies that are similar in important respects
  - Forecasting alternative realistic scenarios for the venture and developing projections consistent with each

Estimating uncertainty

- Assessing risk using historical data

Year	*−5*	*−4*	*−3*	*−2*	*−1*
Sales growth	+20.0%	+12.5%	−3.7%	0.0%	+11.5%
Expected sales growth	+8.06%	+8.06%	+8.06%	+8.06%	+8.06%
Deviation from expected	+11.94%	+4.44%	−11.76%	−8.06%	+3.44%

- Calculate the standard deviation of sales growth
  - $\sigma_{\text{Forecast error}} = 9.71\%$
  - Forecast for Year 0
    - $\mu = 8.06\%$
    - $\sigma = 9.71\%$
- Difficult to estimate for new ventures

Estimating uncertainty

- Sensitivity analysis
  - vary model assumptions and see the impact on the forecast
  - It can clarify which parameters are most important in the forecast
  - shortcomings
    - developing estimates for uncertainty of assumptions
    - ignores interdependencies among variables

- Incorporating uncertainty with simulation
  - assign probability distributions to key variables
  - estimate correlations among variables
  - based on historical data, yardsticks, or fundamental analysis

Estimating uncertainty – Developing alternative scenarios

- One way to come to terms with the uncertainty is to try to define a small number of scenarios in addition to the success scenario
- Some of the possibilities are:
  - A scenario where development efforts are successful but the product faces a weak level of competition from other successful development efforts
  - A scenario where successful development efforts are offset by development of strong competing products
  - A scenario where development efforts are not successful and the project is abandoned
- The challenge for the entrepreneur is to develop the alternative scenarios with realistic assumptions of their effects on product price and quantity and realistic assessment of their relative probabilities

Estimating uncertainty

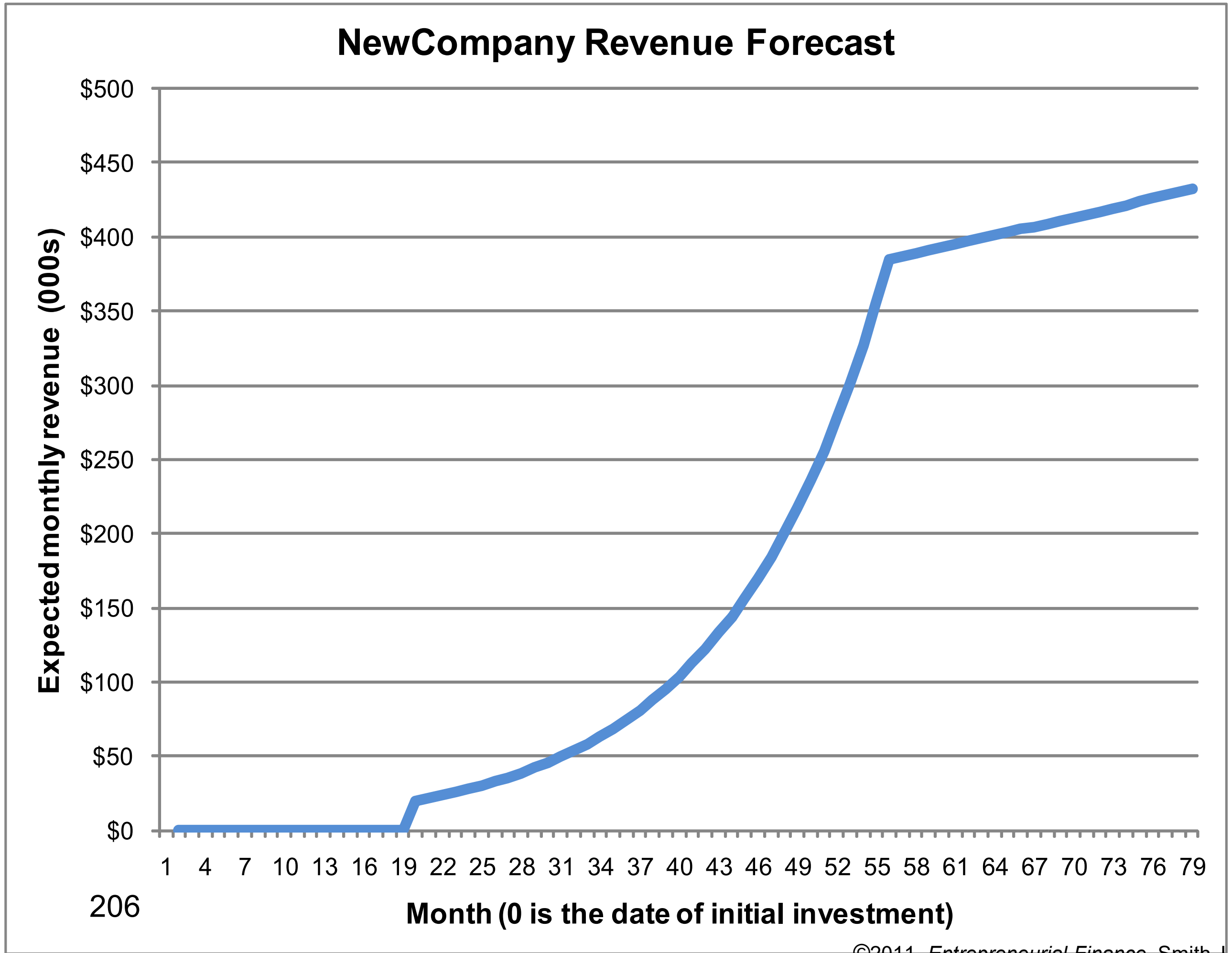
- Incorporating uncertainty with simulation
  - Identify the assumptions behind the forecast
  - assign probability distributions to key variables
  - estimate correlations among variables
  - based on historical data, yardsticks, or fundamental analysis

Building a financial model: an example

- NewCompany is a medical device start-up
- Assumptions:
  - Development will require 18 months, during which no sales will be made
  - Initial montly sales of 100 units at a price of $200 beginning in the 19th month
  - Unit sales will grow 8% per month for three years and then remain constant
  - The sales price will increase each month at the inflation rate
  - Inflation at 6 percent per year (0,50 per month)

NewCompany - Revenue Forecast

Month	0	1	18	19	24	36	48	54	55	56	60	72	78
Sales (units)				100	147	373	940	1,491	1,610	1,610	1,610	1,610	1,610
Selling Price/unit				$200.00	$205.05	$217.70	$231.12	$238.15	$239.34	$240.53	$245.38	$260.51	$268.43
Revenue		$0	$0	$20,000	$30,142	$81,201	$217,257	$355,075	$385,331	$387,258	$395,061	$419,428	$432,169
Unit Growth per Month					8.00%	8.00%	8.00%	8.00%	8.00%	0.00%	0.00%	0.00%	0.00%
Inflation per Month					0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%



Building a financial model: an example

- Range of outcomes is complete failure to phenomenal success
- Uncertainty about
  - product development
  - demand
  - growth
  - competition
- Impact on financing need and value

Introducing uncertainty to the forecast: sensitivity analysis

- Variation in monthly inflation
- Estimates from historical data and/or forecasts
- Impact on revenue

Inflation scenario	*Annual inflation*	*Monthly inflation*	*Revenue* Month 78	*Revenue* Average/month	*Revenue* Cumulative
Low	3%	0.25%	\$373,000	\$212,000	\$12,717,000
Expected	6%	0.50%	\$432,000	\$235,000	\$14,074,000
High	9%	0.75%	\$500,000	\$260,000	\$15,588,000

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Introducing uncertainty to the forecast: sensitivity analysis

- Variation in monthly sales growth

Growth scenario	Unit growth (monthly)	Units			Cumulative revenue
		Month 78	Average/month	Cumulative	
Low	4%	406	291	17,438	$4,187,000
Expected	8%	1,610	958	57,498	$13,074,000
High	12%	5,936	3,185	191,070	$47,277,000

- Revenue forecast is much more sensitive to monthly sales growth than inflation

Introducing uncertainty to the forecast: sensitivity analysis

- Variation in inflation and sales growth

Cumulative revenue over forecast period

		Monthly growth in unit sales		
Monthly inflation		*Low (4%)*	*Expected (8%)*	*High (12%)*
Low	0.25%	\$3,857,000	\$12,614,000	\$42,338,000
Expected	0.50%	\$4,229,000	\$13,960,000	\$47,104,000
High	0.75%	\$4,642,000	\$15,462,000	\$52,432,000

- Shortcomings of sensitivity analysis
  - little guidance for assumption ranges
  - difficult to assess more than two variables
  - does not accommodate correlation of variables

Introducing uncertainty to the forecast: scenario analysis

- Can include more variables and incorporate interdependencies

NewCompany Scenario 1

Product development proceeds more quickly than expected. The venture's sales start at 100 units in Month 12 rather than Month 19. The new product does very well in the market and NewCompany is able to patent important aspects of the technology. This keeps competitors at bay, and allows NewCompany to increase the initial selling price to $220. Unit sales grow at 11 percent each month for two years and then 9 percent monthly for one year. For the balance of the forecast period, Month 49 to Month 78, monthly unit sales are assumed constant so that revenue grows at the 0.5 percent inflation rate.

Introducing uncertainty to the forecast: scenario analysis

NewCompany Scenario 2

Product development hits numerous roadblocks and a competitor beats NewCompany to the market. When NewCompany finally begins to sell (in Month 24), the market only supports a $180 price. Unit sales start at 100 and grow at 4 percent each month for two years and then 2 percent for one year before falling to zero. Expected inflation is 0.5 percent per month.

Introducing uncertainty to the forecast: scenario analysis

- Impact of NewCompany scenarios on revenue forecast

	Revenue			*Unit sales*		
	Month 78	*Monthly average*	*Cumulative*	*Month 78*	*Monthly average*	*Cumulative*
Scenario 1	$1,231,301	$693,069	$41,584,139	4,027	2,501	150,062
Scenario 2	$75,639	$47,189	$2,831,359	321	243	13,379

- These scenarios provide a rough picture of the uncertainty about the venture's future

Methods of financial forecasting – Revenue: summary

- Methods of forecasting revenue for an established business
- Forecasting new venture revenue
  - yardsticks and fundamental analysis
- Demand and supply considerations
- Introducing uncertainty
  - sensitivity analysis
  - developing scenarios
  - simulation

Chapter 7

METHODS OF FINANCIAL FORECASTING: INTEGRATED FINANCIAL MODELING

An overview of financial statements

- Income Statement
- Balance Sheet
- Cash Flow Statement

Income statement

- Also called a profit and loss statement (P&L) or statement of operations
- Describes the revenues and expenses over a period of time
- Answers the question: Is the venture profitable?

Income statement

Revenue
− Cost of goods sold (COGS)
= Gross profit
− Operating expenses
= Earnings before interest and taxes (EBIT)
+ Interest income − Interest expense
= Earnings before tax (EBT)
− Income tax expense
= Net income (NI)

Income statement

- Fixed vs. variable expenses: operating leverage
- Line items reflect type of business
  - retailer
  - manufacturer
  - service
- Non-cash expenses: depreciation & amortization
- EBIT (Operating Profit) is a core performance metric
- Net Income = “the bottom line”

Balance sheet

- Also called the statement of financial position
- Depicts the venture's financial position at a point in time

Balance sheet

Assets	*Liabilities*
Current assets	Current liabilities
Cash	Accounts payable (A/P)
Accounts receivable (A/R)	Wages payable
Inventory	Notes payable
Total current assets	Total current liabilities
	Long-term debt
Fixed assets (PP&E)	Total liabilities
Gross fixed assets	Equity
Less: accumulated depreciation	Common stock
Net fixed assets	Retained earnings
Intangible assets	Total equity
Total assets	Total liabilities and equity

Balance sheet - Assets

- Cash: minimum level needed for operations
- Working capital items
  - accounts receivable (A/R)
  - inventory
- Fixed assets
  - real estate
  - factory and equipment
  - basis for depreciation expense on the income statement
- Intangible assets
  - patents, trademarks and other intellectual property
  - goodwill (from acquisitions)
  - subject to amortization

Balance sheet – Liabilities and equity

- Working capital items
  - accounts payable (A/P)
  - wages payable
- Interest bearing liabilities
  - notes payable
  - long-term debt
  - basis for interest expense on the income statement
- Equity
  - common stock
  - retained earnings

Balance sheet

- Impact of changes on cash flow
  - Assets $\uparrow \Rightarrow$ Cash $\downarrow$
  - Assets $\downarrow \Rightarrow$ Cash $\uparrow$
  - Liabilities or Equity $\uparrow \Rightarrow$ Cash $\uparrow$
  - Liabilities or Equity $\downarrow \Rightarrow$ Cash $\downarrow$

- Changes to retained earnings

  Beginning retained earnings

  \+ Net Income (Loss)

  – Dividends

  = Ending retained earnings

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Cash Flow Statement

- Reconciles net income to cash flow
- Three categories
  - operating
  - investing
  - financing
- Critical to determining financing needs and valuation

Cash Flow Statement

Net Income
Plus: depreciation and amortization
(Increase) decrease in accounts receivable
(Increase) decrease in inventory
Increase (decrease) in accounts / wages payable
Operating cash flow
Less: change in gross fixed assets

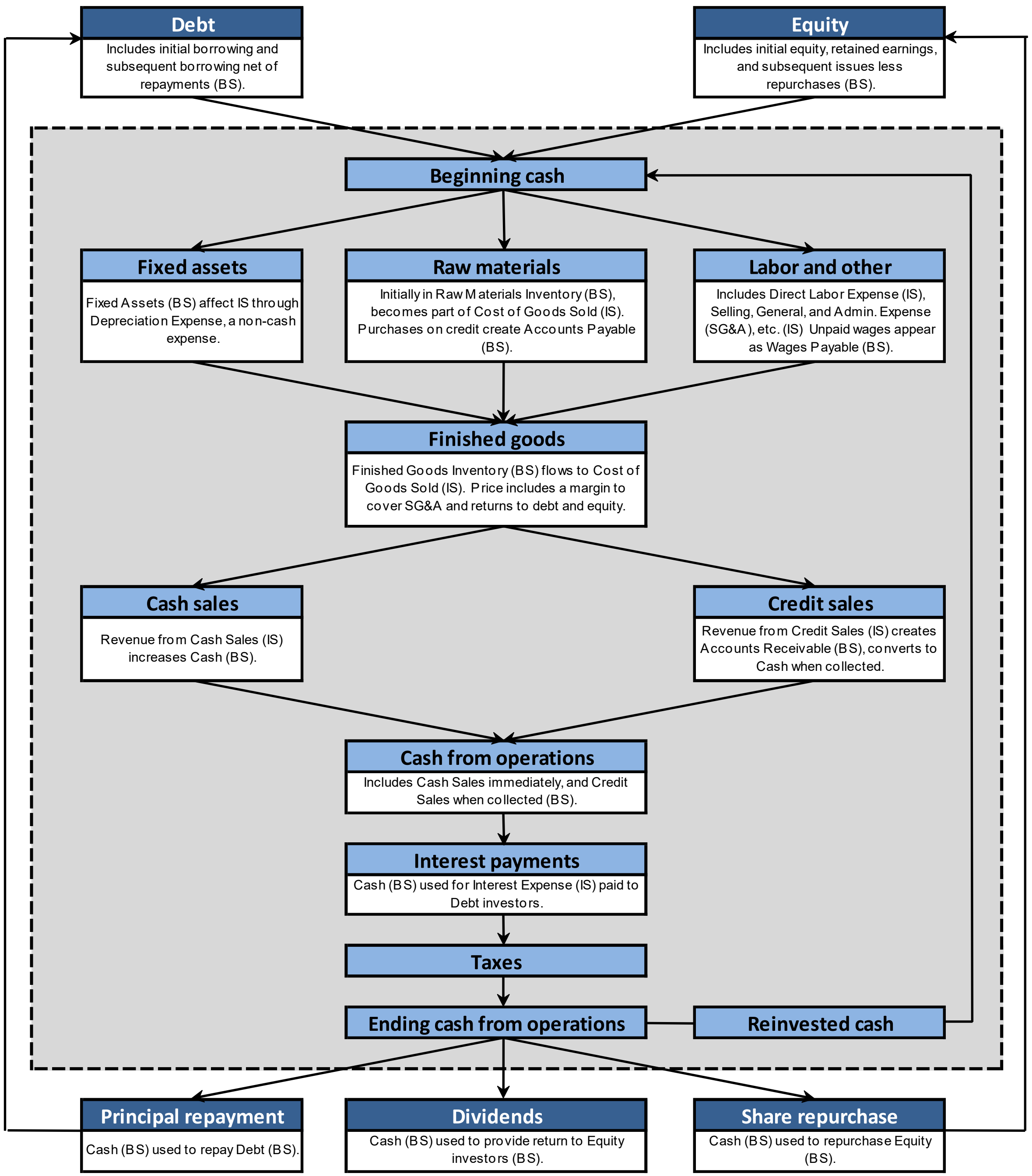
Investing cash flow
Increase (decrease) in notes payable
Increase (decrease) in long-term debt
Increase (decrease) in common stock
Less: dividends paid

Financing cash flow
Net cash flow
Plus: beginning cash
Ending cash

The cash flow cycle

- A business venture is like a machine that converts cash today into cash in the future
- A prospective entrepreneur hopes the venture represents a technology that is particular good at converting present into future cash, so that a small investment of cash and effort today can be expected to produce a large cash payoff in the future
- Any time there is a difference between the timing of revenue or expense recognition on the company's books and the timing of cash flow inflow or outflow, a disparity will exist between net income and net cash flow
- It is important to distinguish between accounting income and cash flow, and that a profitable venture can have significant negative cash flows over long periods

The cash conversion cycle of the firm



The cash conversion cycle

- Operating/investing activities inside shaded box
- Financing activities outside shaded box
- Distinction between cash and non-cash transactions
- Return of cash to capital providers

Working capital, growth, and financial needs

- The most important components are
  - inventory
  - accounts receivable
  - accounts payable
  - cash
- Working capital is usually related to the level of sales

Working capital financing

- NWC = Current WC assets – current WC liabilities

  positive NWC $\Rightarrow$ cash funding required

  negative NWC $\Rightarrow$ operations are self-financing

- Most ventures require NWC funding

- Faster growth means more cash needed

Working capital, growth, and financial needs

- Working capital at Amazon.com at 12/31/2009
  - inventory = \$2.17 billion
  - accounts receivable = \$1.06 billion
  - accounts payable = \$5.61 billion

- Net working capital (NWC) = A/R + Inv. – A/P
  = \$2.17 + \$1.06 - \$5.61
  = (\$2.38) billion

- Amazon.com had \$2.4 billion of cash generated by its negative NWC

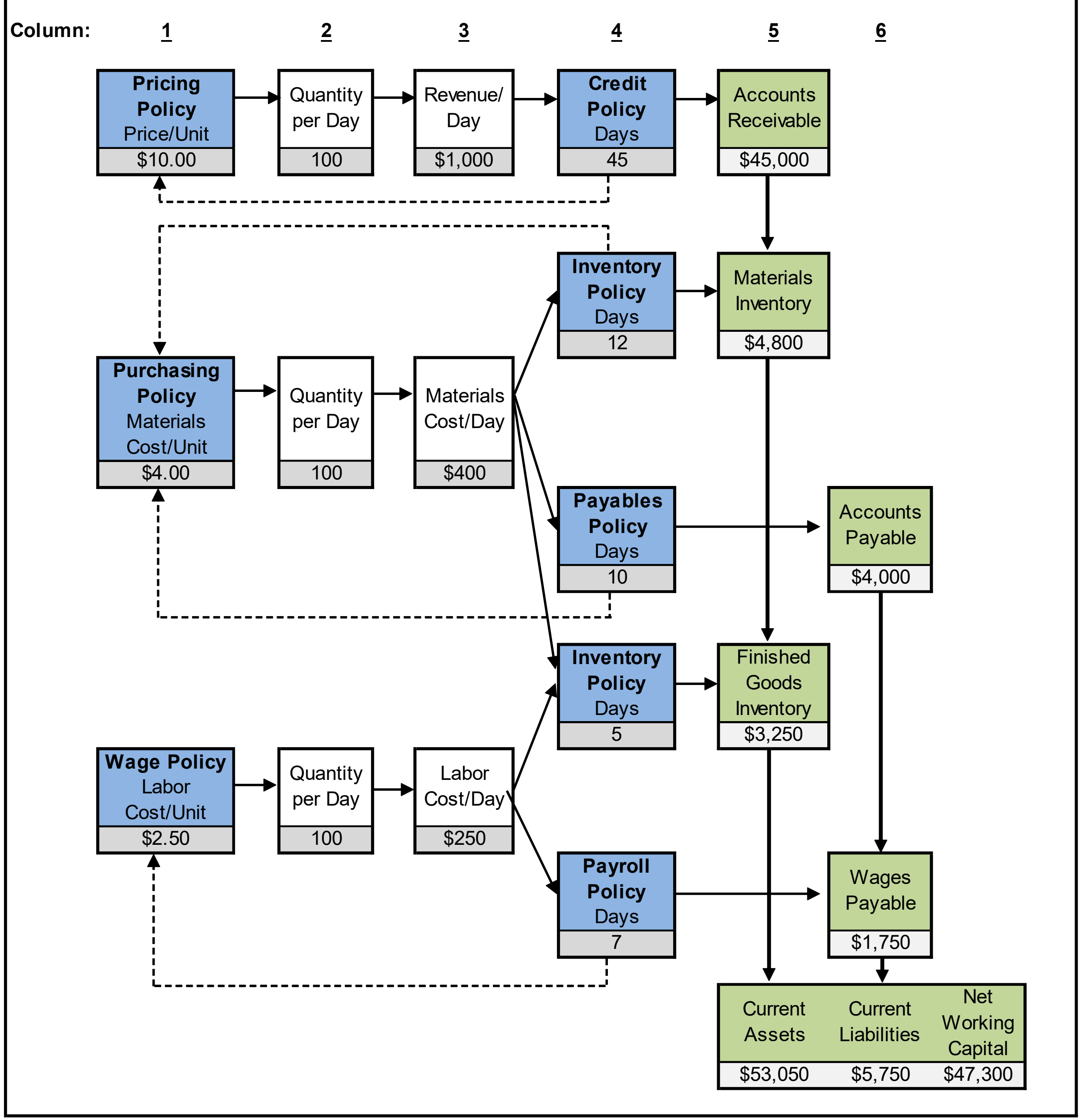
Working capital

- The term working capital applies to the current assets of a venture that are integral to its operations
- The most important component of working capital usually are inventory, accounts receivable, and cash
- The most important sources of spontaneous financing are inventory that is purchased on terms (increase in accounts payable) and wages that are paid in arrears (increase in wages payable)
- Spontaneous financing can be changed in deliberate ways by changing working capital management practice
- The net working capital is the difference between the sum of the current asset categories of working capital and the spontaneous liabilities

Working capital

- If the balance of net working capital is positive, it must be financed in some way
- If net working capital is negative, then the productive activities of the venture are not only self-financing, they also generate financing for other assets
- For a company that presents a positive balance of net working capital, the larger the business grows, the more it requires financing of net working capital

Financing Needs and Working Capital Policy



Working capital policy

- Pricing policy
- Credit policy
- Purchasing and inventory policies
- Payables Policy
- Wage and payroll policies

Forecasting income statement and balance sheet information

- We are concerned with cash flow from operations: to calculate it is necessary to work through the income statement and the balance sheet
- For a new venture, it is useful to rely on data for public companies that are comparable
- Critical income statement relationship are likely to be sensitive to factors such as business size, intensity of competition in the product market, and capital intensity of the production process
- Only few expenses are truly fixed, and others may vary more than proportionately with changes in sales
- Assuming that variable expenses will change in proportion to sales and that fixed expenses will not change is likely to overstate the potential profitability associated with sales growth
- Assumptions about the cost structure of the venture should be consistent with reality. If in an industry the companies are all large, then scale economies (fixed costs) is an important factor

General rules of financial forecasting

- The time span covered by the forecast depends on how the forecast is to be used. If used for assessing financial needs, the time span should cover the period until the firm is expected to attract follow-on financing. If used to determining the value of the venture, the time span should take the venture to the point of harvesting
- Test the reasonableness of the model by thinking through the relations among line items across financial statements
- Try a basic «what if» analysis to see if the results are consistent with theory. For example, if cash sales growth is reduced and accounts receivables falls, then cash needs should fall. Ask yourself whether the magnitudes of the changes make sense
- Try a basic sensitivity analysis to make sure that the model yields reasonable results when magnitudes and growth rates or key variables change

Introduction to pro forma analysis

- Pro forma analysis is the most widely used method of financial forecasting, and the method that is most useful for new venture finance
- Pro forma analysis is simply a prediction of how the venture's financial statement will look in the future
- Suppose a venture begins today, with total assets of $1 million and no debt. The following are the assumptions:
  - Sales = 2 x Beginning assets
  - Net income = Sales x $0,10
  - All sales are for cash and economic depreciation is equal to accounting depreciation
- Suppose market demand during the first year is just sufficient to be achieved by the sales capabilities of the firm and that demand is expected to grow at an annual rate of 6 percent

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Introduction to pro forma analysis

- Beginning at time zero, the venture has total assets of \$1 million (all equity), and no sales revenue
- During the first year, the venture is expected to generate sales of \$2 million (sales = 2 x beginning assets) and result in net income of \$200.000 (net income = sales x \$0,10)
- Cash flow at the end of the first year is equal to \$200.000
- Because the model of the economy implies that demand will be 6 percent higher next year, the venture needs to retain enough earnings to support \$2,12 million in sales during the second year
- So, the venture can retain \$60.000 and distribute the remaining \$140.000 to the entrepreneur
  - Retained earnings = Beginning assets x 0,06
  - Dividends = Net income - Retained earnings
  - Ending assets = Beginning assets + Retained earnings

Introduction to pro forma analysis

Year	Beginning assets	Sales	Net income	Retained earnings	Dividends	Ending assets
1	1.000.000	2.000.000	200.000	60.000	140.000	1.060.000
2	1.060.000	2.120.000	212.000	63.600	148.400	1.123.600
3	1.123.600	2.247.200	224.720	67.416	157.304	1.191.016
4	1.191.016	2.382.032	238.203	71.461	166.742	1.262.477
5	1.262.477	2.524.954	252.495	75.749	176.747	1.338.226

Assumptions:

- Sales = 2 x Beginning assets
- Net income = Sales x 0,10
- Retained earnings = Beginning assets x 0,06
- Dividends = Net income - Retained earnings
- Ending assets = Beginning assets + Retained earnings

Integrating pro forma financial statements

The statements are interdependent:

- Income statement changes affect balance sheet and cash flow statement
  - e.g., higher profit may lead to increased cash balances
- Balance sheet changes affect income statement and cash flow statement
  - e.g., borrowing leads to interest expense and reduces taxes

A financial model should integrate the statements

Pro forma financial statement

		Beginning	Period 1	Period 2	Period 3	Period 4	Period 5	ETC.
1		Beginning	Period 1	Period 2	Period 3	Period 4	Period 5	ETC.
2								
3	**Sales Forecast**							
4								
5	**Income Statement**							
6	Sales Revenue							
7	less: Cost of Goods Sold							
8	GROSS PROFIT		0	0	0	0	0	
9	less: Selling Expenses							
10	General and Administrative Expenses							
11	Depreciation Expense							
12	Other Operating Expenses							
13	Total Operating Expenses		0	0	0	0	0	
14	OPERATING PROFIT		0	0	0	0	0	
15	less: Interest and Other Expenses							
16	plus: Interest and Other Revenues							
17	PRE-TAX INCOME		0	0	0	0	0	
18	Income Tax							
19	NET INCOME		0	0	0	0	0	

A period length (month, quarter, year, etc.) should be selected that is appropriate for the purpose of the analysis. Start the projections with the Sales Forecast (lines 3 and 6) and beginning balances (first column) of accounts in the balance sheet

Cost of Goods Sold (line 7) often can be estimated as a percentage of sales, possibly based on industry norms for ventures of similar size or engineering studies of manufacturing cost

Pro forma financial statement

Operating Expense items (lines 9 through 12) can include fixed and variable components, and often can be estimated in a manner similar to Cost of Goods Sold

Depreciation Expense (line 11) is determined by previous asset acquisitions and accounting and tax policies

Interest Expense (line 15) can be estimated based on the balance of interest-bearing debt outstanding at the end of the prior period. If the period is long, it may be necessary to consider changes in the level of debt during the period

Interest Revenue (line 16) can be estimated in a manner similar to Interest Expense, but for interest-earning assets

Income Tax (line 18) can be estimated using the statutory tax rate and adjusting for any tax loss carry forwards

Pro forma financial statement

21	**Cash Flow Statement**					
22	Net Income					
23	Depreciation Expense					
24	OPERATING CASH FLOW	0	0	0	0	0
25	plus: Increase in Accounts Payable					
26	Increase in Other Payables					
27	less: Increases in Accounts Receivable					
28	Increase in Inventory					
29	OPERATING SOURCES (USES) OF CASH	0	0	0	0	0
30	plus: Net Cash from Financing Activities					
31	less: Net Investment Outlays					
32	CHANGE IN CASH	0	0	0	0	0
33	plus: Beginning Cash					
34	ENDING CASH BALANCE	0	0	0	0	0

Operating Cash Flow (line 24) is determined by adding noncash expenses back to Net Income (line 19)

Pro forma financial statement

36	**Balance Sheet**						
37	***ASSETS***						
38	Cash and Equivalents						
39	Accounts Receivable						
40	Inventory						
41	CURRENT ASSETS	0	0	0	0	0	0
42	Net Fixed Assets						
43	TOTAL ASSETS	0	0	0	0	0	0
44	***LIABILITIES***						
45	Accounts Payable						
46	Notes Payable						
47	Wages Payable						
48	Taxes Payable						
49	Current Portion of Long-Term Debt						
50	CURRENT LIABILITIES	0	0	0	0	0	0
51	Long-Term Debt						
52	TOTAL LIABILITIES	0	0	0	0	0	0
53	Common Stock						
54	Retained Earnings						
55	TOTAL EQUITY	0	0	0	0	0	0
56	TOTAL LIABILITIES AND EQUITY	0	0	0	0	0	0

Determine desired or expected levels of Current Assets except for Cash (line 38), and of Current Liabilities except for Current Portion of Long-term Debt (line 49, which is determined by the contractual provisions of financing decisions made in previous periods), and Notes Payable (line 46, which may be affected by a new financing decision), and record in the Balance Sheet

Pro forma financial statement

Using the Balance Sheet information for the period and for the prior period, determine the changes in each current accounts except for Cash and Current Portion of Long-term Debt, and record the changes in the Cash Flow Statement

Under Net Cash from Financing Activities (line 30), record only the contractually committed repayments of long-term debt and any desired distributions to equity holders

Repayments of Notes Payable are captured by the change in Notes Payable
Under Net Investment Outlays (line 31), determine the desired level of new gross investment in fixed assets and offset with any expected asset sales or other dispositions.

This may be based on consideration of the level required to support sales for the period, or it may be based on longer-term considerations

Complete the Cash Flow Statement to determine the Ending Cash Balance (line 34) assuming no new financing

Record Net Fixed Assets (line 42) in the Balance Sheet as the prior balance, less Depreciation Expense and the book value of asset dispositions, and plus the cost of fixed assets acquired

Pro forma financial statement

At this point, Notes Payable, Current Portion of Long-term Debt, and Long-term Debt are determined by the contractual provisions of previous financing decisions

The balance of Common Stock (line 53) is unchanged from the prior period, and Retained Earnings (line 54) is computed as Net Income less any dividends desired to be distributed to investors

The cash shortfall or surplus of the venture can be determined by comparing the Ending Cash Balance (line 34) to the desired level of Cash and Equivalents (line 38)

The difference is the amount of new financing required

Revise the balance of Cash and Equivalents (line 38) to reflect the desired level of cash

In the event of a cash shortfall, determine the desired sources of additional financing (Notes Payable, Long-term Debt or Equity) and adjust the Balance Sheet accounts accordingly

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Pro forma financial statement

In the event of a surplus, decide whether to repay debt early or make additional distributions to equity

Depending on the choice, it may be necessary to adjust other accounts related to dividend distributions and interest expense

Revise Net Cash from Financing Activities (line 30) to reflect the financing decisions

Re-compute the Ending Cash Balance (line 34), which should now equal the desired level of Cash and Equivalents in the Balance Sheet

Developing assumptions for the financial model

- Industry and comparable data
  - private companies
    - RMA, CCH, Dun & Bradstreet, IRS
  - public companies
    - SEC/company filings
    - Compustat, S&P Industry reports, Value Line, Hoovers, etc.
    - analyst reports
  - trade associations
- Fundamental analysis

Using Industry Data and SEC Filings

- Morebucks assumptions
  - D&B Key Business Ratio statistics
  - Peet’s Coffee and Tea, Inc. IPO prospectus

Key Business Ratios for Eating and Drinking Establishments

SIC Code		5813			5812			5812	
Line of Business		Drinking Places			Eating Places			Eating Places	
Asset Size		All Asset Ranges			All Asset Ranges			$500,000 to $1,000,000	
Sample Size		Statement Sampling: 12			Statement Sampling: 202			Statement Sampling: 42	
Solvency	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**
Quick Ratio (times)	3.1	**0.9**	0.4	1.0	**0.5**	0.2	1.7	**0.7**	0.3
Current Ratio (times)	6.0	**1.3**	0.7	2.0	**0.9**	0.6	2.2	**1.4**	0.7
Current Liabilities / Net Worth (%)	6.7	**31.1**	90.3	23.0	**49.2**	103.5	19.7	**36.9**	99.7
Current Liabilities / Inventory (%)	86.4	**415.0**	777.3	326.9	**768.8**	999.9	263.2	**506.5**	929.6
Total Liabilities / Net Worth (%)	40.3	**127.6**	260.9	38.5	**101.7**	275.2	24.7	**49.9**	157.8
Fixed Assets / Net Worth (%)	80.7	**107.4**	193.2	63.4	**112.9**	194.9	29.4	**75.9**	117.2
Efficiency									
Collection Period (days)	2.6	**3.5**	6.2	1.5	**4.8**	11.7	0.7	**1.8**	7.0
Sales / Inventory (times)	96.8	**60.1**	46.1	128.4	**87.4**	47.0	125.9	**70.6**	36.2
Assets / Sales (%)	23.5	**70.4**	112.2	24.5	**45.7**	71.4	21.2	**28.5**	46.7
Sales / Net Working Capital (times)	144.6	**24.1**	10.4	29.4	**14.4**	7.8	28.6	**20.7**	6.8
Accounts Payable / Sales (%)	1.3	**1.8**	2.5	1.8	**3.0**	4.1	2.2	**3.0**	3.7
Profitability									
Return on Sales (%)	8.2	**3.8**	-3.0	5.6	**2.1**	-0.6	6.8	**3.3**	0.8
Return on Assets (%)	19.3	**5.1**	-4.1	13.0	**4.9**	-1.0	19.2	**10.5**	2.3
Return on Net Worth (%)	19.5	**11.6**	-35.9	28.3	**12.0**	-0.3	38.7	**20.6**	5.3

http://kbr.dnb.com/KBR_Main.asp

Peet's Coffee and Tea, Inc. Financials Prior to IPO

	Fiscal Year ($000)				
	1995	1996	1997	1998	1999
Income Statement					
Total revenue	33,252	40,137	50,733	58,685	67,807
Operating expenses:					
Cost of sales and related occupancy expenses	17,870	21,526	26,531	28,749	31,923
Gross profit	15,382	18,611	24,202	29,936	35,884
Operating expenses	8,545	11,247	14,768	17,969	21,902
Marketing and advertising	719	810	2,279	2,176	3,491
General and administrative expenses	3,974	2,522	3,962	5,961	6,230
Depreciation and amortization	1,586	1,790	2,211	2,711	3,404
Total operating costs and expenses	32,694	37,895	49,747	57,566	66,950
Income (loss) from operations	558	2,242	987	1,119	857
Interest expense			487	765	1,022
Other income			(90)	(56)	(37)
Interest expense, net, and other	325	244	396	709	985
Income (loss) before income taxes	233	1,998	591	410	(128)
Income tax provision (benefit)	(129)	851	250	242	16
Net income (loss)	362	1,147	342	168	(144)

SOURCE: *Form S-1, filed January 23, 2001.*

Balance Sheet Data	1995	1996	1997	1998	1999
Assets					
Current assets:					
Cash and cash equivalents	334	2,156	888	873	1,074
Accounts receivable				430	740
Inventories				9,007	7,211
Other current assets				963	1,168
Total current assets				11,273	10,193
Net working capital	2,402	2,230	(2,301)		
Fixed and intangible assets:					
Property and equipment, net				16,385	21,780
Intangible and other assets, net				2,206	2,677
Total assets	22,293	22,637	25,724	29,864	34,650
Liabilities and Shareholders' Equity					
Current liabilities:					
Accounts payable				4,569	4,353
Accrued compensation and benefits				1,318	1,914
Other accrued liabilities				546	996
Short-term borrowings	870	1,810	3,470	6,173	8,416
Total current liabilities				12,606	15,679
Long term liabilities:					
Long term borrowings, less current portion	4,900	4,882	3,412	6,467	7,780
Total liabilities				19,073	23,459
Shareholders' equity:					
Preferred stock	5,482	5,482	4,537	4,537	4,537
Common stock issued and outstanding				7,422	7,966
Accumulated deficit				(1,168)	(1,312)
Total shareholders' equity.	10,006	11,173	10,318	10,791	11,191
Total liabilities and shareholders' equity	22,293	22,637	25,724	29,864	34,650

Peet's Coffee and Tea, Inc. Financials Prior to IPO

Number of Stores in Operation	1995	1996	1997	1998	1999
Beginning of Year	19	25	30	39	43
Store openings	6	5	9	5	11
Stores closed				1	1
End of Year	25	30	39	43	53

SOURCE: *Form S-1, filed January 23, 2001.*

Common size statements

Peet's Coffee and Tea, Inc. Financials Prior to IPO

	Fiscal Year ($000)				
	1995	**1996**	**1997**	**1998**	**1999**
Income Statement					
Total revenue	100.0%	100.0%	100.0%	100.0%	100.0%
Operating expenses:					
Cost of sales and related occupancy expenses	53.7%	53.6%	52.3%	49.0%	47.1%
Gross profit	46.3%	46.4%	47.7%	51.0%	52.9%
Operating expenses	25.7%	28.0%	29.1%	30.6%	32.3%
Marketing and advertising	2.2%	2.0%	4.5%	3.7%	5.1%
General and administrative expenses	12.0%	6.3%	7.8%	10.2%	9.2%
Depreciation and amortization	4.8%	4.5%	4.4%	4.6%	5.0%
Total operating costs and expenses	98.3%	94.4%	98.1%	98.1%	98.7%
Income (loss) from operations	1.7%	5.6%	1.9%	1.9%	1.3%
Interest expense			1.0%	1.3%	1.5%
Other income			-0.2%	-0.1%	-0.1%
Interest expense, net, and other	1.0%	0.6%	0.8%	1.2%	1.5%
Income (loss) before income taxes	0.7%	5.0%	1.2%	0.7%	-0.2%
Income tax provision (benefit)	-0.4%	2.1%	0.5%	0.4%	0.0%
Net income (loss)	1.1%	2.9%	0.7%	0.3%	-0.2%

SOURCE: *Form S-1, filed January 23, 2001.*

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Balance Sheet Data	1995	1996	1997	1998	1999
Assets					
Current assets:					
Cash and cash equivalents	1.5%	9.5%	3.5%	2.9%	3.1%
Accounts receivable				1.4%	2.1%
Inventories				30.2%	20.8%
Other current assets				3.2%	3.4%
Total current assets				37.7%	29.4%
Net working capital	10.8%	9.9%	-8.9%		
Fixed and intangible assets:					
Property and equipment, net				54.9%	62.9%
Intangible and other assets, net				7.4%	7.7%
Total assets	100.0%	100.0%	100.0%	100.0%	100.0%
Liabilities and Shareholders' Equity					
Current liabilities:					
Accounts payable				15.3%	12.6%
Accrued compensation and benefits				4.4%	5.5%
Other accrued liabilities				1.8%	2.9%
Short-term borrowings	3.9%	8.0%	13.5%	20.7%	24.3%
Total current liabilities				42.2%	45.2%
Long term liabilities:				0.0%	0.0%
Long term borrowings, less current portion	22.0%	21.6%	13.3%	21.7%	22.5%
Total liabilities				63.9%	67.7%
Shareholders' equity:					
Preferred stock	24.6%	24.2%	17.6%	15.2%	13.1%
Common stock issued and outstanding				24.9%	23.0%
Accumulated deficit				-3.9%	-3.8%
Total shareholders' equity.	44.9%	49.4%	40.1%	36.1%	32.3%
Total liabilities and shareholders' equity	100.0%	100.0%	100.0%	100.0%	100.0%

Peet's Coffee and Tea, Inc. Financial Ratios

Financial Ratio	Fiscal Year 1995	1996	1997	1998	1999
Asset Turnover	1.49	1.77	1.97	1.97	1.96
Fixed Asset Turnover				3.58	3.11
Accounts Receivable Turnover				136.5	91.6
Days Sales in Accounts Receivable				2.64	3.93
Inventory Turnover				3.19	4.43
Days Cost of Sales in Inventory				112.8	81.3
Sales/Inventory				6.52	9.40
Accounts Payable/Cost of Sales				15.9%	13.6%
Days Cost of Sales in Accounts Payable				57.2	49.1
Compensation Payable/Cost of Sales				4.6%	6.0%
Cash/Revenue	1.00%	5.37%	1.75%	1.49%	1.58%
Days Revenue in Cash	3.62	19.34	6.30	5.36	5.70

Definitions

Asset Turnover = Sales/Assets
Fixed Asset Turnover = Sales/Net Fixed Assets
Accounts Receivable Turnover = Sales/Accounts Receivable
Days Sales in Accounts Receivable = Accounts Receivable/(Sales/360)
Inventory Turnover = Cost of Sales/Inventory
Days Cost of Sales in Inventory = Inventory/(Cost of Sales/360)
Days Cost of Sales in Accounts Payable = Accounts Payable/(Cost of Sales/360)
Days Revenue in Cash = Cash/(Revenue/360)

Using industry data and SEC filings

- Risk factors from Peet's prospectus
  - inability to implement the business strategy
  - inability to identify strategic locations suitable for new stores
  - inability to manage growth
  - competitive conditions existing in the industry and local market
  - dependence on a single product, that is, specialty coffee
  - consumer tastes and preferences
  - demographic and consumer traffic trends
  - type, number, and locations of competing stores,
  - costs of employee compensation and benefits
  - fluctuations in the availability, quality, and cost of coffee
  - health concerns related to caffeine

Developing assumptions with fundamental analysis

- Using fundamental analysis to test benchmark assumptions
- Yardstick data may not be available for new ventures
- Most useful for estimating balance sheet items
- Morebucks fundamental analysis
  - fixed asset investment
  - operating expenses
    - rent
    - wages

Building a financial model of the venture

- Goal is a set of integrated financial statements
  - capture interactions between statements
  - reflect assumption changes across all statements
  - add time dimension to accommodate growth

Building a financial model of the venture

- Morebucks
  - Year 1 revenue is $600,000
  - Year 2 & 3 revenue is $900,000
  - assumptions from yardstick data and fundamental analysis
- Step 1: Income statement assumptions
- Step 2: Net working capital and fixed assets
- Step 3: Investment assumption

Morebucks Pro Forma Financial Model

Pro Forma Income Statement	Time 0	Year 1	Year 2	Year 3	Assumption	Basis for Assumption
Net revenue	0	600.000	900.000	900.000		From revenue forecast
Cost of sales and occupancy		319.200	478.800	478.800	53,2%	From Peet's common size statement
Gross Profit	0	280.800	421.200	421.200		
Operating expenses		165.600	248.400	248.400	27,6%	From Peet's common size statement
General and administrative expenses		52.200	78.300	78.300	8,7%	From Peet's common size statement
Depreciation and amortization expenses						
Income from operations	0	63.000	94.500	94.500		
Interest income (expense), net						
Income before income taxes	0	63.000	94.500	94.500		
Income tax provision		22.050	33.075	33.075	35%	Effective rate based on statute
Net income	0	40.950	61.425	61.425		

Pro Forma Balance Sheet	**Time 0**	**Year 1**	**Year 2**	**Year 3**
Assets				
Current Assets				
Required Cash				
Surplus Cash				
Accounts Receivable				
Inventory				
Total Current Assets	0	0	0	0
Fixed Assets, Gross	0	0	0	0
Less: Accumulated Depreciation		0	0	0
Net Fixed Assets	0	0	0	0
Total Assets	0	0	0	0
Liabilities				
Current Liabilities				
Accounts Payable				
Wages Payable				
Total Current Liabilities	0	0	0	0
Long-Term Debt				
Total Liabilities	0	0	0	0
Equity				
Common Stock				
Retained Earnings				
Total Equity	0	0	0	0
Total Liabilities and Equity	0	0	0	0

Pro Forma Cash Flow Statement	Year 1	Year 2	Year 3
Operating Cash Flow			
Net Income	40.950	61.425	61.425
Plus: Depreciation	0	0	0
(Increase) Decrease in Accounts Receivable			
(Increase) Decrease in Inventory			
Increase (Decrease) in Accounts Payable			
Increase (Decrease) in Wages Payable			
Operating Cash Flow	40.950	61.425	61.425
Investing Cash Flow			
(Increase) Decrease in Gross Fixed Assets			
Investing Cash Flow			
Financing Cash Flow			
Increase (Decrease) in Debt			
Increase (Decrease) in Common Stock			
Dividend Paid			
Financing Cash Flow	0	0	0
Net Cash Flow	40.950	61.425	61.425
Beginning Cash			
Ending Cash	40.950	61.425	61.425

Morebucks Pro Forma Financial Model

Pro Forma Income Statement	Time 0	Year 1	Year 2	Year 3	Assumption	Basis for Assumption
Net revenue	0	600.000	900.000	900.000		From revenue forecast
Cost of sales and occupancy		319.200	478.800	478.800	53,2%	From Peet's common size statement
Gross Profit	0	280.800	421.200	421.200		
Operating expenses		165.600	248.400	248.400	27,6%	From Peet's common size statement
General and administrative expenses		52.200	78.300	78.300	8,7%	From Peet's common size statement
Depreciation and amortization expenses		50.000	50.000	50.000	7	Years, straight line - On Fixed Assets, Gross
Income from operations	0	13.000	44.500	44.500		
Interest income (expense), net						
Income before income taxes	0	13.000	44.500	44.500		
Income tax provision		4.550	15.575	15.575	35%	Effective rate based on statute
Net income	0	8.450	28.925	28.925		

Pro Forma Balance Sheet	Time 0	Year 1	Year 2	Year 3	Assumption	Basis for Assumption
Assets						
Current Assets						
Required Cash	0	9.000	13.500	13.500	1,50%	Based on Peet's Cash/Revenue ratios
Surplus Cash	0	-278.494	-193.041	-114.116		
Accounts Receivable	0	6.000	9.000	9.000	100	Based on Peet's Revenue/Accts. Rec. ratio
Inventory	0	7.500	11.250	11.250	80	Based on Industry Sales/Inventory ratio
Total Current Assets	0	-255.994	-159.291	-80.366		
Fixed Assets, Gross	0	350.000	350.000	350.000	350.000	Based on fundamental analysis
Less: Accumulated Depreciation		-50.000	-100.000	-150.000		
Net Fixed Assets	0	300.000	250.000	200.000		
Total Assets	0	44.006	90.709	119.634		
Liabilities						
Current Liabilities						
Accounts Payable	0	18.000	27.000	27.000	3,00%	Based on Accts. Pay./Sales ratio
Wages Payable	0	17.556	26.334	26.334	5,50%	Based on Peet's Compensation/Cost of Sales ratio
Total Current Liabilities	0	35.556	53.334	53.334		
Long-Term Debt	0	0	0	0		
Total Liabilities	0	35.556	53.334	53.334		
Equity						
Common Stock						
Retained Earnings		8.450	37.375	66.300		
Total Equity	0	8.450	37.375	66.300		
Total Liabilities and Equity	0	44.006	90.709	119.634		

Pro Forma Cash Flow Statement	Year 1	Year 2	Year 3
Operating Cash Flow			
Net Income	8.450	28.925	28.925
Plus: Depreciation	50.000	50.000	50.000
(Increase) Decrease in Accounts Receivable	-6.000	-3.000	0
(Increase) Decrease in Inventory	-7.500	-3.750	0
Increase (Decrease) in Accounts Payable	18.000	9.000	0
Increase (Decrease) in Wages Payable	17.556	8.778	0
Operating Cash Flow	80.506	89.953	78.925
Investing Cash Flow			
(Increase) Decrease in Gross Fixed Assets	-350.000	0	0
Investing Cash Flow	-350.000	0	0
Financing Cash Flow			
Increase (Decrease) in Debt	0	0	0
Increase (Decrease) in Common Stock			
Dividend Paid	0	0	0
Financing Cash Flow	0	0	0
Net Cash Flow	-269.494	89.953	78.925
Beginning Cash	0	-269.494	-179.541
Ending Cash	-269.494	-179.541	-100.616

Pro Forma Balance Sheet	Time 0	Year 1	Year 2	Year 3	Assumption	Basis for Assumption
Assets						
Current Assets						
Required Cash	0	9.000	13.500	13.500	1,50%	Based on Peet's Cash/Revenue ratios
Surplus Cash	375.000	96.506	181.959	260.884		
Accounts Receivable	0	6.000	9.000	9.000	100	Based on Peet's Revenue/Accts. Rec. ratio
Inventory	0	7.500	11.250	11.250	80	Based on Industry Sales/Inventory ratio
Total Current Assets	375.000	119.006	215.709	294.634		
Fixed Assets, Gross		350.000	350.000	350.000	350.000	Based on fundamental analysis
Less: Accumulated Depreciation		-50.000	-100.000	-150.000		
Net Fixed Assets	0	300.000	250.000	200.000		
Total Assets	375.000	419.006	465.709	494.634		
Liabilities						
Current Liabilities						
Accounts Payable	0	18.000	27.000	27.000	3,00%	Based on Accts. Pay./Sales ratio
Wages Payable	0	17.556	26.334	26.334	5,50%	Based on Peet's Compensation/Cost of Sales ratio
Total Current Liabilities	0	35.556	53.334	53.334		
Long-Term Debt	0	0	0	0		
Total Liabilities	0	35.556	53.334	53.334		
Equity						
Common Stock	375.000	375.000	375.000	375.000	375.000	Selected to cover start-up investments
Retained Earnings		8.450	37.375	66.300		
Total Equity	375.000	383.450	412.375	441.300		
Total Liabilities and Equity	375.000	419.006	465.709	494.634		

Pro Forma Cash Flow Statement	Time 0	Year 1	Year 2	Year 3
Operating Cash Flow				
Net Income	0	8.450	28.925	28.925
Plus: Depreciation	0	50.000	50.000	50.000
(Increase) Decrease in Accounts Receivable	0	-6.000	-3.000	0
(Increase) Decrease in Inventory	0	-7.500	-3.750	0
Increase (Decrease) in Accounts Payable	0	18.000	9.000	0
Increase (Decrease) in Wages Payable	0	17.556	8.778	0
Operating Cash Flow	0	80.506	89.953	78.925
Investing Cash Flow				
(Increase) Decrease in Gross Fixed Assets	0	-350.000	0	0
Investing Cash Flow	0	-350.000	0	0
Financing Cash Flow				
Increase (Decrease) in Debt	0	0	0	0
Increase (Decrease) in Common Stock	375.000			
Dividend Paid		0	0	0
Financing Cash Flow	375.000	0	0	0
Net Cash Flow	375.000	-269.494	89.953	78.925
Beginning Cash	0	375.000	105.506	195.459
Ending Cash	375.000	105.506	195.459	274.384

Building a financial model of the venture

- Morebucks pro forma results
  - profitable every year
  - surplus cash
- Impact of changing assumptions

	Base Case	New Assumptions
Investment in Fixed Assets	\$350,000	\$320,000
Sales	\$600,000	\$400,000
Net Income	\$8,450	(\$2,414)
Operating Cash Flow	\$80,506	\$58,004
Surplus Cash	\$96,506	\$107,004

Adding Uncertainty to the Model

- Morebucks model is static
  - all assumptions are fixed and tied to revenue
- Introducing uncertainty

Variable	*Distribution assumption*
Year 1 sales	= triangular with minimum of \$300,000, mode of \$600,000, and maximum of \$700,000.
Year 2 sales	= triangular with minimum of \$750,000, mode of \$900,000, and maximum of \$1,000,000.
Year 3 sales	= normally distributed with mean of Year 2 sales and standard deviation of \$25,000.
Operating expense	= maximum of \$120,000 or a percentage of sales, normally distributed with mean of 27.6 percent and standard deviation of 2 percent.

Morebucks Pro Forma Financial Model

Pro Forma Income Statement	Time 0	Year 1	Year 2	Year 3	Assumption	Basis for Assumption
Net revenue	0	435.958	826.639	851.944		From revenue forecast
Cost of sales and occupancy		231.929	439.772	453.234	53,2%	From Peet's common size statement
Gross Profit	0	204.028	386.867	398.710		
Operating expenses		124.403	235.885	243.106	28,5%	From Peet's common size statement
General and administrative expenses		37.928	71.918	74.119	8,7%	From Peet's common size statement
Depreciation and amortization expenses		50.000	50.000	50.000	7	Years, straight line - On Fixed Assets, Gross
Income from operations	0	-8.303	29.064	31.484		
Interest income (expense), net						
Income before income taxes	0	-8.303	29.064	31.484		
Income tax provision		0	10.172	11.020	35%	Effective rate only applies to positive income
Net income	0	-8.303	18.892	20.465		

Pro Forma Balance Sheet	Time 0	Year 1	Year 2	Year 3	Assumption	Basis for Assumption
Assets						
Current Assets						
Required Cash	0	6.539	12.400	12.779	1,50%	Based on Peet's Cash/Revenue ratios
Surplus Cash	375.000	76.184	153.577	224.592		
Accounts Receivable	0	4.360	8.266	8.519	100	Based on Peet's Revenue/Accts. Rec. ratio
Inventory	0	5.449	10.333	10.649	80	Based on Industry Sales/Inventory ratio
Total Current Assets	375.000	92.532	184.576	256.540		
Fixed Assets, Gross		350.000	350.000	350.000	350.000	Based on fundamental analysis
Less: Accumulated Depreciation		-50.000	-100.000	-150.000		
Net Fixed Assets	0	300.000	250.000	200.000		
Total Assets	375.000	392.532	434.576	456.540		
Liabilities						
Current Liabilities						
Accounts Payable	0	13.079	24.799	25.558	3,00%	Based on Accts. Pay./Sales ratio
Wages Payable	0	12.756	24.187	24.928	5,50%	Based on Peet's Compensation/Cost of Sales ratio
Total Current Liabilities	0	25.835	48.987	50.486		
Long-Term Debt	0	0	0	0		
Total Liabilities	0	25.835	48.987	50.486		
Equity						
Common Stock	375.000	375.000	375.000	375.000	375.000	Selected to cover start-up investments
Retained Earnings		-8.303	10.589	31.054		
Total Equity	375.000	366.697	385.589	406.054		
Total Liabilities and Equity	375.000	392.532	434.576	456.540		

Pro Forma Cash Flow Statement	Time 0	Year 1	Year 2	Year 3
Operating Cash Flow				
Net Income	0	-8.303	18.892	20.465
Plus: Depreciation	0	50.000	50.000	50.000
(Increase) Decrease in Accounts Receivable	0	-4.360	-3.907	-253
(Increase) Decrease in Inventory	0	-5.449	-4.884	-316
Increase (Decrease) in Accounts Payable	0	13.079	11.720	759
Increase (Decrease) in Wages Payable	0	12.756	11.431	740
Operating Cash Flow	0	57.723	83.253	71.395
Investing Cash Flow				
(Increase) Decrease in Gross Fixed Assets	0	-350.000	0	0
Investing Cash Flow	0	-350.000	0	0
Financing Cash Flow				
Increase (Decrease) in Debt	0	0	0	0
Increase (Decrease) in Common Stock	375.000			
Dividend Paid		0	0	0
Financing Cash Flow	375.000	0	0	0
Net Cash Flow	375.000	-292.277	83.253	71.395
Beginning Cash	0	375.000	82.723	165.976
Ending Cash	375.000	82.723	165.976	237.371

Simulation Results from the Morebucks Financial Model

Unconditional Simulation Results

Trials = 5000

Venture.SIM

						Percentiles				
	Output	***Average***	***Median***	***Standard Deviation***	***Skewness***	***Minimum***	***25%***	***50%***	***75%***	***Maximum***
1	Year 1 Sales	$532,230	$543,898	$84,897	-0.417	$302,629	$472,007	$543,898	$599,013	$699,461
2	Year 2 Sales	$883,416	$886,977	$51,483	-0.181	$750,888	$846,751	$886,977	$921,096	$997,067
3	Year 3 Sales	$883,782	$886,585	$56,238	-0.134	$730,198	$844,020	$886,585	$924,587	$1,033,112
4	Year 1 Net Income	($16,518)	($12,871)	$16,118	-0.685	($74,699)	($27,346)	($12,871)	($7,852)	$20,021
5	Year 2 Net Income	$14,508	$13,987	$12,687	-0.314	($44,566)	$5,881	$13,987	$22,924	$53,760
6	Year 3 Net Income	$14,539	$14,345	$12,737	-0.232	($45,078)	$5,963	$14,345	$23,285	$60,724
7	Operating CF Year 1	$73,047	$78,388	$18,667	-0.726	$6,426	$60,440	$78,388	$82,947	$112,907
8	Operating CF Year 2	$97,418	$97,365	$13,588	-0.243	$39,087	$88,683	$97,365	$106,589	$141,033
9	Operating CF Year 3	$84,552	$84,452	$12,848	-0.183	$24,339	$75,709	$84,452	$93,410	$133,821
10	Operating Expense %	27.6%	27.6%	2.0%	0.019	21.2%	26.2%	27.6%	28.9%	34.9%

NewCompany financial model

- NewCompany is a medical device start-up
- Assumptions:
  - Development will require 18 months, during which period no sales will be made
  - Initial volume will be 100 units with a $200 per unit selling price, beginning in the 19th month
  - Sales volume will grow 8 percent per month for three years and zero thereafter
  - Operating expenses during the 18-month development period are projected to be $20,000 per month plus inflation (includes the Entrepreneur's salary of $3,000 per month)
  - Annual inflation is projected to be 6.0 percent, or 0.5 percent per month
  - Cost of sales is projected to be 50 percent of revenue

NewCompany financial model

- Beginning in month 19, the venture is expected to incur fixed Selling General and Administrative (SG&A) expenses of $30,000 per month, growing at the inflation. This includes the Entrepreneur’s salary. Variable SG&A expenses are projected to be 20 percent of sales
- A production facility will come on line at the end of month 18 and is expected to be adequate for the ensuing five years of operation (through month 78). Monthly lease payments for the facility and production equipment will begin in month 19 and are included in fixed SG&A expenses
- The effective corporate tax rate is projected to be 35 percent on positive income with no loss carry-forward, i.e., any loss in a given period gets no tax credit and cannot accumulate to offset future profits

NewCompany financial model

- All sales are for credit. Accounts receivable (A/R) are expected to be equivalent to 45 days' sales. This means 100 percent of the current month's sales and 50 percent of the prior month's sales are in the A/R balance at the end of each month
- The inventory turnover rate is projected to be 6 times per year or 60 days' cost of sales in inventory. In each month, the inventory balance will be the forecasted cost of sales for the following two months
- All materials are purchased on credit. The average payables period is projected to be 20 days and is calculated based on cost of sales. This means the accounts payable balance each month will be 2/3 of the forecasted cost of sales two months later.

NewCompany financial model

- The company needs to maintain a minimum cash balance equal to either 20 percent of the prior month's sales or $15,000, whichever is greater
- Initial equity investment by the entrepreneur is $500,000. Additional funding, if needed, will come from a hypothetical line of credit with no limit. Interest on the credit line is 0.75 percent monthly (9 percent annually)
- Free cash flow in any period will first be used to reduce the balance of the line of credit, and then will be accumulated as surplus cash. Surplus cash earns interest income at 0.33 percent monthly (4 percent annually)

NewCompany financial model

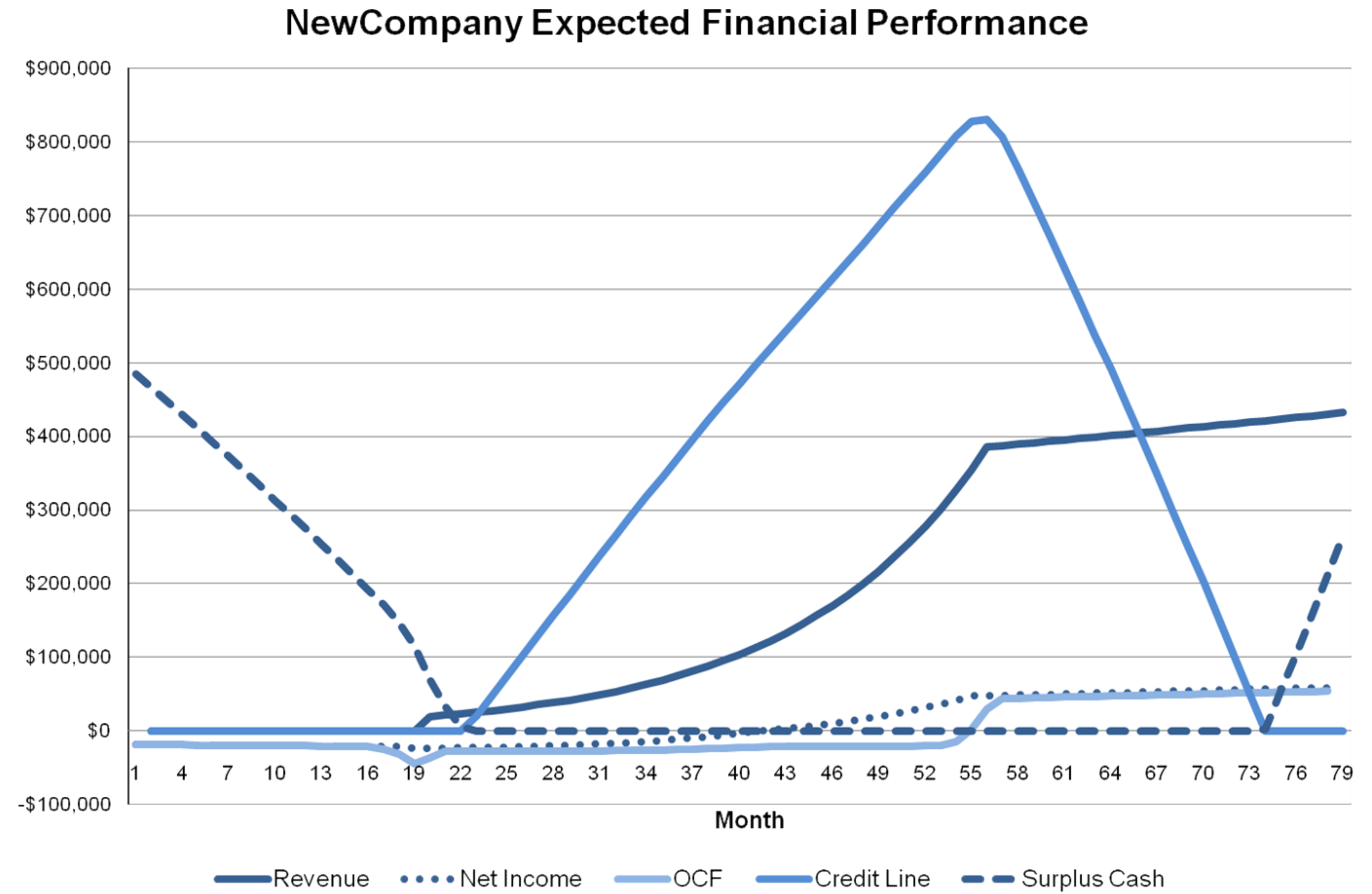
- The place to begin the pro-forma analysis is with the forecast of sales. Because this is a new venture, we decide to use a forecasting interval of one month
- Because our other assumption include a mix of costs that are fixed in nominal terms (rent and the salary to entrepreneur) and other that are fixed in real terms, we have decided to develop the analysis in nominal terms (taxes are calculated on nominal terms, too)
- We selected the months to include in the figure because they correspond to major milestones: development, initiation of external financing, start of revenue-generating operation, attainment of profitable operation, attainment of positive cash flow, and the end of five years of operation
- Under the heading for month 0, the beginning balance sheet shows the only one asset the company has: cash

NewCompany Pro Forma Financial Statements

Month	0	1	18	19	20	21	22	23	41	42	54	55	56	77	78
Income Statement															
Unit Sales		$ -	$ -	$ 100	$ 108	$ 117	$ 126	$ 136	$ 549	$ 593	$ 1,491	$ 1,610	$ 1,610	$ 1,610	$ 1,610
Selling Price		$ -	$ -	$ 200.00	$ 201.00	$ 202.01	$ 203.02	$ 204.03	$ 223.19	$ 224.31	$ 238.15	$ 239.34	$ 240.53	$ 267.09	$ 268.43
Revenue	$ -	$ -	$ -	$ 20,000	$ 21,708	$ 23,635	$ 25,580	$ 27,748	$ 122,534	$ 133,016	$ 355,075	$ 385,331	$ 387,258	$ 430,019	$ 432,169
Cost of Sales		$ -	$ -	$ 10,000	$ 10,854	$ 11,817	$ 12,790	$ 13,874	$ 61,267	$ 66,508	$ 177,537	$ 192,666	$ 193,629	$ 215,009	$ 216,084
Gross Profit		$ -	$ -	$ 10,000	$ 10,854	$ 11,817	$ 12,790	$ 13,874	$ 61,267	$ 66,508	$ 177,537	$ 192,666	$ 193,629	$ 215,009	$ 216,084
Development expense		$ 20,000	$ 21,770	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SG&A Expense		$ -	$ -	$ 34,000	$ 34,492	$ 35,028	$ 35,568	$ 36,154	$ 57,986	$ 60,250	$ 106,737	$ 112,967	$ 113,531	$ 126,068	$ 126,698
Operating Profit		$ (20,000)	$ (21,770)	$ (24,000)	$ (23,638)	$ (23,210)	$ (22,778)	$ (22,280)	$ 3,281	$ 6,258	$ 70,801	$ 79,699	$ 80,097	$ 88,942	$ 89,386
Interest Income (Expense), net		$ 1,617	$ 488	$ 383	$ 234	$ 112	$ 22	$ (155)	$ (3,721)	$ (3,898)	$ (6,059)	$ (6,203)	$ (6,227)	$ 530	$ 707
Profit before income tax		$ (18,383)	$ (21,281)	$ (23,617)	$ (23,404)	$ (23,098)	$ (22,757)	$ (22,435)	$ (440)	$ 2,360	$ 64,742	$ 73,496	$ 73,870	$ 89,472	$ 90,093
Tax Expense		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 826	$ 22,660	$ 25,724	$ 25,855	$ 31,315	$ 31,533
Net Income		$ (18,383)	$ (21,281)	$ (23,617)	$ (23,404)	$ (23,098)	$ (22,757)	$ (22,435)	$ (440)	$ 1,534	$ 42,082	$ 47,772	$ 48,016	$ 58,157	$ 58,561
Balance Sheet															
Cash	$ 500,000	$ 481,617	$ 129,930	$ 85,138	$ 48,739	$ 21,526	$ 15,000	$ 15,000	$ 22,564	$ 24,507	$ 65,449	$ 71,015	$ 77,066	$ 297,602	$ 351,500
Accounts Receivable		$ -	$ -	$ 20,000	$ 31,708	$ 34,489	$ 37,397	$ 40,538	$ 178,943	$ 194,283	$ 518,696	$ 562,869	$ 579,923	$ 643,959	$ 647,178
Inventory		$ -	$ 20,854	$ 22,671	$ 24,607	$ 26,664	$ 28,945	$ 31,454	$ 138,646	$ 150,414	$ 386,294	$ 388,226	$ 390,167	$ 433,249	$ 435,416
Total Current Assets		$ 481,617	$ 150,784	$ 127,809	$ 105,054	$ 82,679	$ 81,342	$ 86,992	$ 340,153	$ 369,204	$ 970,439	$ 1,022,109	$ 1,047,157	$ 1,374,809	$ 1,434,094
Fixed Assets, gross															
Accumulated Depreciation															
Fixed Assets, net															
Total Assets		$ 481,617	$ 150,784	$ 127,809	$ 105,054	$ 82,679	$ 81,342	$ 86,992	$ 340,153	$ 369,204	$ 970,439	$ 1,022,109	$ 1,047,157	$ 1,374,809	$ 1,434,094
Accounts Payable		$ -	$ 7,236	$ 7,878	$ 8,527	$ 9,249	$ 10,047	$ 10,922	$ 48,092	$ 52,184	$ 129,086	$ 129,731	$ 130,380	$ 144,777	$ 145,500
Total Current Liabilities		$ -	$ 7,236	$ 7,878	$ 8,527	$ 9,249	$ 10,047	$ 10,922	$ 48,092	$ 52,184	$ 129,086	$ 129,731	$ 130,380	$ 144,777	$ 145,500
Long Term Debt (Credit Line)	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,622	$ 47,832	$ 519,717	$ 543,142	$ 827,049	$ 830,301	$ 806,684	$ -	$ -
Total Liabilities		$ -	$ 7,236	$ 7,878	$ 8,527	$ 9,249	$ 30,669	$ 58,754	$ 567,810	$ 595,326	$ 956,135	$ 960,033	$ 937,064	$ 144,777	$ 145,500
Equity	$ 500,000	$ 481,617	$ 143,548	$ 119,931	$ 96,527	$ 73,430	$ 50,673	$ 28,238	$ (227,656)	$ (226,122)	$ 14,304	$ 62,077	$ 110,092	$ 1,230,033	$ 1,288,593
Total Liabilities and Equity	$ 500,000	$ 481,617	$ 150,784	$ 127,809	$ 105,054	$ 82,679	$ 81,342	$ 86,992	$ 340,153	$ 369,204	$ 970,439	$ 1,022,109	$ 1,047,157	$ 1,374,809	$ 1,434,094
Statement of Cash Flows															
Operating Cash Flow															
Net Income		$ (18,383)	$ (21,281)	$ (23,617)	$ (23,404)	$ (23,098)	$ (22,757)	$ (22,435)	$ (440)	$ 1,534	$ 42,082	$ 47,772	$ 48,016	$ 58,157	$ 58,561
Plus: Depreciation Expense															
Changes in:															
less: Increase in Accounts Receivable		$ -	$ -	$ (20,000)	$ (11,708)	$ (2,781)	$ (2,909)	$ (3,141)	$ (14,194)	$ (15,340)	$ (40,671)	$ (44,172)	$ (17,055)	$ (3,204)	$ (3,220)
less: Increase in Inventory		$ -	$ (10,854)	$ (1,817)	$ (1,936)	$ (2,057)	$ (2,281)	$ (2,509)	$ (10,871)	$ (11,768)	$ (16,092)	$ (1,931)	$ (1,941)	$ (2,155)	$ (2,166)
plus: Increase in Accounts Payable		$ -	$ 569	$ 642	$ 648	$ 723	$ 798	$ 875	$ 3,753	$ 4,092	$ 642	$ 645	$ 649	$ 720	$ 724
Operating Cash Flow		$ (18,383)	$ (31,566)	$ (44,792)	$ (36,399)	$ (27,213)	$ (27,148)	$ (27,210)	$ (21,753)	$ (21,482)	$ (14,038)	$ 2,314	$ 29,668	$ 53,518	$ 53,898
Investing Cash Flow															
Change in Gross Fixed Assets															
Financing Cash Flow															
Change in Long Term Debt (Credit Line)		$ -	$ -	$ -	$ -	$ -	$ 20,622	$ 27,210	$ 23,544	$ 23,425	$ 19,174	$ 3,253	$ (23,617)	$ -	$ -
Dividend															
Financing Cash Flow		$ -	$ -	$ -	$ -	$ -	$ 20,622	$ 27,210	$ 23,544	$ 23,425	$ 19,174	$ 3,253	$ (23,617)	$ -	$ -
NET CASH FLOW		$ (18,383)	$ (31,566)	$ (44,792)	$ (36,399)	$ (27,213)	$ (6,526)	$ -	$ 1,792	$ 1,943	$ 5,136	$ 5,566	$ 6,051	$ 53,518	$ 53,898
Beginning Cash		$ 500,000	$ 161,496	$ 129,930	$ 85,138	$ 48,739	$ 21,526	$ 15,000	$ 20,772	$ 22,564	$ 60,313	$ 65,449	$ 71,015	$ 244,084	$ 297,602
Ending Cash	$ 500,000	$ 481,617	$ 129,930	$ 85,138	$ 48,739	$ 21,526	$ 15,000	$ 15,000	$ 22,564	$ 24,507	$ 65,449	$ 71,015	$ 77,066	$ 297,602	$ 351,500
Financing Activity															
New Financing Needed		$ -	$ -	$ -	$ -	$ -	$ 20,622	$ 27,210	$ 23,544	$ 23,425	$ 19,174	$ 3,253	$ -	$ -	$ -
Debt Repayment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 23,617	$ -	$ -

NewCompany financial model

- Financial milestones
  - development success and NWC in Month 18
  - sales start in Month 19
  - borrowing on line of credit starts in Month 22
  - profitability in Month 42
  - positive operating cash flow in Month 55
  - credit line borrowing peaks at $830,301 in Month 55
  - repayment of credit line starts in Month 56
  - credit line paid off on Month 73
  - Month 78 cash of $351,500


NewCompany Expected Financial Performance
$900,000
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
-$100,000
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79
Month
Revenue
Net Income
OCF
Credit Line
Surplus Cash

Uncertainty in the NewCompany model

- Simulation assumptions from Chapter 6
  - development time
  - initial selling price
  - duration and magnitude of monthly sales growth

- Additional simulation assumptions
  - cost of sales
  - monthly development expense
  - variable SG&A expense

Uncertainty in the NewCompany model

REVENUE ASSUMPTIONS	
Development Completion Month (lognormal distribution)	
Preliminary Month	21
Development Completion Month	21
Development failure (1=yes)	0
Rapid Growth Period (normal distribution)	
Std deviation of rapid growth period	3
Realized Length of rapid growth period	44
Initial Unit Sales per Month	
Initial units/month	100
Unit Sales Growth during Rapid Growth (normal distribution)	
Expected growth/month	8.00%
Std deviation of growth/month	1.50%
Realized Growth Rate per Month	9.56%
Initial Selling Price (normal distribution)	
Expected initial selling price	$ 200.00
Std deviation of selling price	$ 10.00
Realized Initial Selling Price	$ 211.05
Inflation Rate per Month	
Inflation / month	0.50%

Uncertainty in the NewCompany model

- Additional simulation assumptions

Variable	Distribution Assumption
Cost of Sales	= uniform distribution with minimum of 45% and maximum of 55%
Development Expense	= normally distributed with mean of $20,000 and standard deviation of $200
Variable SG&A Expense	= triangular distribution with minimum of 18%, most likely of 20%, and maximum of 30%

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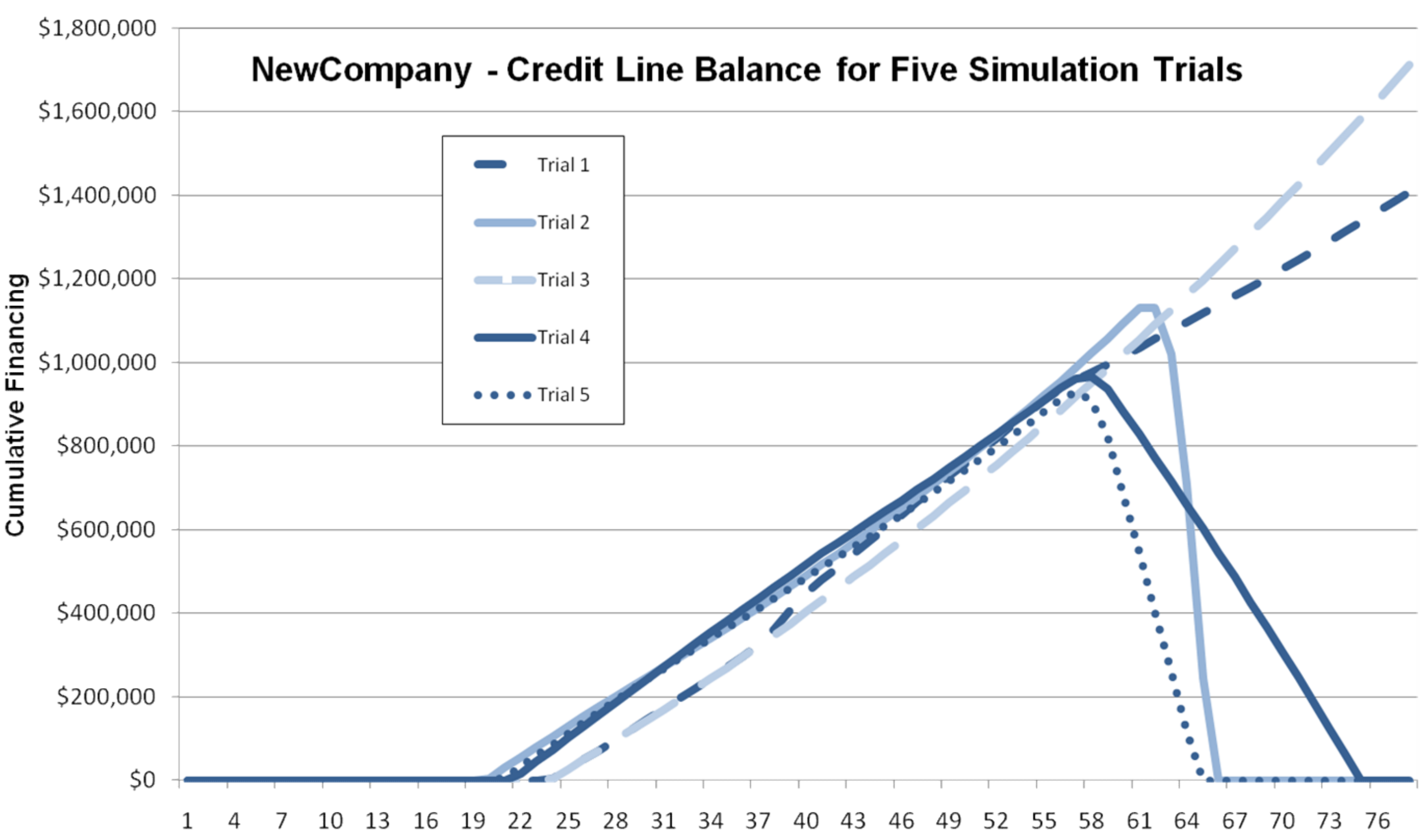
Uncertainty in the NewCompany model

INCOME STATEMENT ASSUMPTIONS	
Cost of Sales (uniform distribution)	
Minumum Cost of sales	45.00%
Maximum Cost of sales	55.00%
Realized Cost of Sales	48.15%
Monthly Development Expense (normal distribution)	
Monthly development expenses (expected)	$ 20,000
Monthly development expenses (std. dev.)	$ 200
Realized Development Expense	$ 19,630
SG&A Expenses (fixed + triangular distribution)	
Monthly Fixed SG&A Expense	$ 30,000
Minimum Variable SG&A (expected % of Sales)	18%
Most Likely SG&A Expense	20%
Maximum SG&A Expense	30%
Realized Variable SG&A Percent of Sales	26.42%
Interest Income and Interst Expense	
Interest Expense per month	0.75%
Interest Income on surplus cash per month	0.33%
Income Tax Expense	
Income Tax Rate (on positive income)	35%

BALANCE SHEET ASSUMPTIONS	
Cash Balance	
Minimum Cash Balance	$ 15,000
Continuing Cash Percent of Prior Month Sales	20.0%
Accounts Receivable Policy (45 days)	
Percent of Current Month Sales	100%
Percent of Prior Month Sales	50%
Inventory Policy (60 days)	
Percent of Next Month Cost of Sales	100%
Percent of Two-Month Hence Cost of Sales	100%
Accounts Payable Policy (20 days)	
Percent of Two-Month Hence Cost of Sales	66.67%
Initial Investment	
Initial Equity Investment	$ 500,000



	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Dev. Month	38	11	79	19	15
Growth Period	17	51	0	38	42
Growth Rate	7.48%	9.36%	5.96%	8.34%	8.87%
Month 78 Profit	($22,756)	$540,970	($42,004)	$70,590	$170,749

NewCompany: summary of key variables for 10,000 trial simulation

Unconditional Simulation Results

Trials = 10000

Venture.SIM

	Output	Average	Median	Standard Deviation	Skewness	Minimum	25%	50%	75%	Maximum
						Percentiles				
1	Ending Revenue	764594	458514	999477	3.73	0.000	172730	458514	966007	14519812
2	Ending Net Income	107114	51988	186134	3.70	-43188	-862	51988	147580	2458522
3	Maximum Borrowing	1359931	1236377	678698	4.97	376094	996063	1236377	1606579	11868962
4	Ending Cash	1013584	97912	2074395	4.14	15000	34374	97912	1118370	29804300
5	Ending Operating Cash Flow	98524	47133	175864	3.69	-46612	-2638	47133	136832	2303521

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Chapter 8

ASSESSING FINANCIAL NEEDS

Assessing financial needs

- An entrepreneur needs to have good sense of how much cash is required to carry the venture to the point where it becomes self-sustaining, as well as a good sense of when the cash infusion are likely to be need
- An entrepreneur who does not evaluate the cash needs of the venture runs a variety of unnecessary risk
- Most fundamentally, the venture may fail, not because the idea is bad, but simply because the entrepreneur does not anticipate the cash needs far enough in advance to do anything about them
- Even if the total cash needs are not large, the entrepreneur's failure to anticipate them can result in an adverse negotiating position in which investors have all the bargaining power

Assessing financial needs

- But having too much cash can be as bad as having too little
- The objective is to finance the venture in a way that yields the highest expected value for the entrepreneur
- After selecting the strategy that is expected to generate the highest value, the entrepreneur prepares the business plan that includes a projection of cash flows and financial needs

Critical determinants of financial needs

- Profitability
  - Profitability reduces financial needs
  - All else being equal, the more profitable a venture, the lower the need for external financing
  - A business that is immediately profitable may be capable to providing internal financing to meet most of its needs
- Cash flow
  - High profitability sometimes goes along with other factors that increase the demand for financing
  - Profitability is not the same thing as cash flow (depreciation; accounts payables and accounts receivables)
- Sales growth
  - Ventures that are profitable and growing rapidly often encounter difficulties generating enough cash to finance the ongoing operations

Factors that increase a firm's cash needs

- Each of these factors affects a firm's financial requirements; and each of these factors represent a "partial effect":
  - Competition in markets where the minimum efficient scale (MES) is large. The venture requires large amount of capital
  - Low profit margins
  - High rates of sales growth
  - Increased reliance on depreciation of assets and less on expensing
  - Expectation of low cash inflow levels
  - Increased trade credit offered (accounts receivable as a fraction of assets is high)
  - Decreased trade credit used (accounts payable as a fraction of assets is high)

Differing schools of thought about early stage financing

- Arguments **for** raising as much money as possible:
  - Liquidity (slack) is a cushion against unexpected setbacks
  - Liquidity affords flexibility to pursue unexpected opportunities
  - Liquidity makes obtaining credit from lenders and suppliers easier
  - Liquidity is comforting for the entrepreneur and key employees

Differing schools of thought about early stage financing

- Arguments **against** raising as much money as possible:
  - Limiting investment limits the loss if the venture fails
  - Limiting investment disciplines the entrepreneur to focus on the objective
  - Limiting investment promotes developing cash-management skills
  - Limiting investment preserves ownership for the entrepreneur

- The different views are not actually in conflict. In deciding how much outside investment to seek and how much liquidity to maintain, all of the factors must be considered

Sustainable growth

- The first step in projecting the financial needs of a nascent venture is to develop a financial model of the venture that relates investment to cash flows. A good starting point is to explore the conditions under which, following an initial investment, the cash flow of the venture is sufficient to sustain growth
- In a venture that growths at the sustainable growth rate, assets, debt financing, sales and net income will all growth in fixed proportion to each other
- Thus, the level of sales the venture can achieve is a constant percentage of assets, and net income is a constant percentage of sales

Sustainable growth model definitions

g	The annual percentage growth rate of equity
*g**	The sustainable annual percentage growth rate of equity, given leverage and dividend policies and no additional outside equity financing
E	The level of equity book value in dollars at the beginning of a year
ΔE	The dollar-valued change in equity book value during the year
NI	Net income after tax for the year, expressed in dollars
R	The earnings retention rate, i.e., the fraction of net income after tax that is retained by the venture and not distributed to investors
ROE	The accounting rate of return on equity, i.e., net income after tax, divided by equity

Sustainable growth model definitions

S	Sales revenue for the year
A	Book value of total assets at the beginning of the year
r	The effective interest rate on debt financing (all non- equity financing)
t	The corporate income tax rate, divided by equity
ROS	The accounting rate of return on sales, i.e., the ratio of net income after tax to sales revenue
EBIT	Accounting net income for the year, before interest and income tax
Turnover	The ratio of sales revenue for the year to total assets at the beginning of the year
Leverage	Ratio of beginning assets to beginning equity

Sustainable growth as a starting point

- The sustainable growth rate, g*, depends on four factors:
  - Asset turnover ("turnover") – the amount of revenue that can be sustained per dollar of assets
  - Financial leverage ("leverage") – the ratio of the venture's assets to its equity, where the difference represents debt financing
  - Return on sales ("ROS") – the profitability of sales
  - Dividend policy ("retention") – the fraction of net income that is retained in the venture, i.e., not paid out as dividends

The sustainable growth model

$$g = \frac{\Delta E}{E} \qquad\qquad \Delta E = NI \times R$$

$$g = \frac{NI}{E} \times R \qquad \text{or } ROE \times R$$

$$ROE = \frac{NI}{E} = \frac{NI}{S} \times \frac{S}{A} \times \frac{A}{E} \qquad \text{or } ROS \times Turnover \times Leverage$$

$$g^* = \frac{NI}{S} \times \frac{S}{A} \times \frac{A}{E} \times R$$

$$NI = (EBIT - r \times (A - E)) \times (1 - t)$$

$$g^* = \frac{(EBIT - r \times (A - E)) \times (1 - t)}{S} \times \frac{S}{A} \times \frac{A}{E} \times R$$

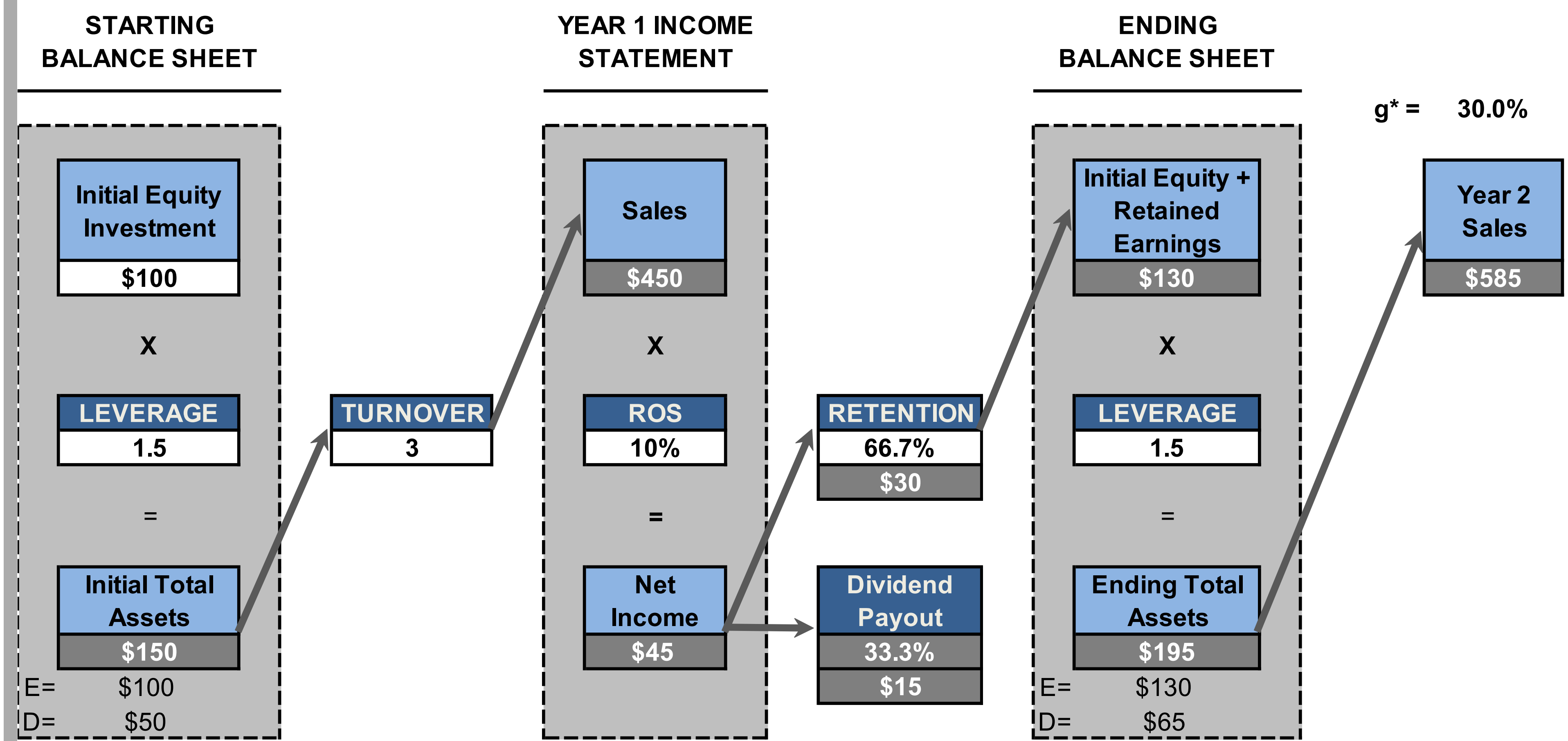
Sustainable growth – An illustration

- Initial assumptions

Factor	*Definition and value*
Asset turnover	Sales / total assets = 3.0
Financial leverage	Total assets / equity = 1.5
Return on sales (ROS)	Net income / sales = 10%
Dividend retention (R)	Fraction of net income retained = 2/3

- The entrepreneur makes an initial equity investment of $100
- Calculate g* and estimate the level of Year 2 sales

THE SUSTAINABLE GROWTH MODEL



The sustainable growth model - Illustration

- Gill Bates' on-line virtual world, *iFree*
  - Year 1 sales: $1 million
  - EBIT: 10% of sales
  - Tax rate: 35 percent
  - Turnover: 2.0
  - Retention rate: 1.0
  - Leverage Ratio: 1.0 (no debt)
  - Interest rate: 10%
  - Initial equity: $500,000

- Goal is $2.5 million of revenue in Year 6

The sustainable growth model - Illustration

- Gill Bates' on-line virtual world, *iFree*

$$
\begin{aligned}
g^* &= \frac{[EBIT - r(A - E)](1 - t)}{\text{Sales}} \times \text{Turnover} \times \text{Leverage} \times R \\
&= \frac{[\$100{,}000 - 10\%(\$0)](1 - 35\%)}{\$1{,}000{,}000} \times 2.0 \times 1.0 \times 100\% \\
&= 13\%
\end{aligned}
$$

- Year 6 Revenue = \$1 million $(1 + .13)^5$ = \$1.84 million

The sustainable growth model - Illustration

- How can *iFree* achieve the Year 6 sales goal of $2.5 million?
  - larger initial equity investment of $678,500
  - raise the EBIT margin to 15.5%
  - increase asset turnover to 2.4
  - increase leverage to 1.26
- Each of these increases g* to 14.7%
- Year 6 Revenue = $1 million $(1 + .147)^5$ = $2.5 million

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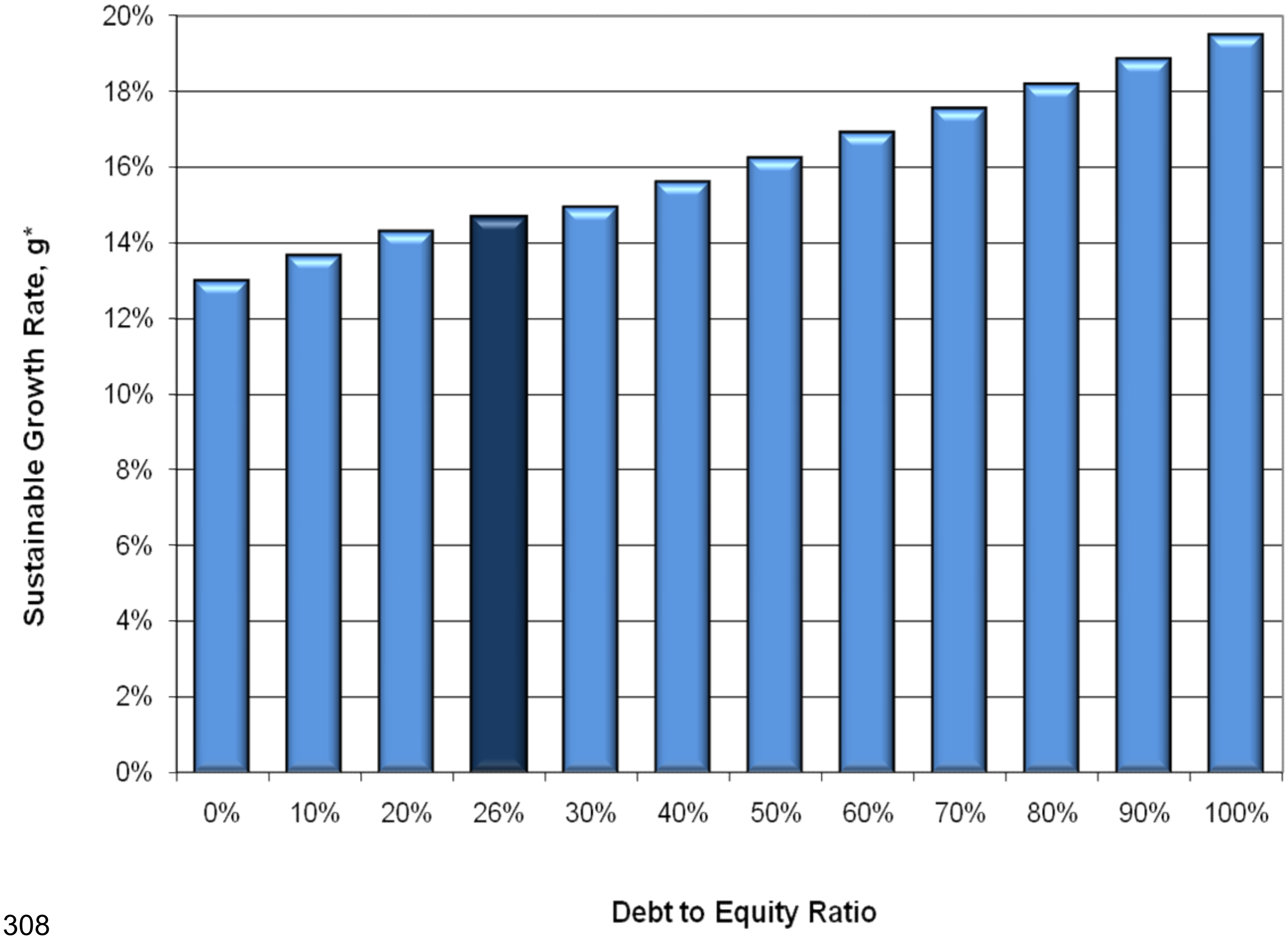
Financial Leverage and Sustainable Growth



The sustainable growth model

- The entrepreneur’s financing decisions can impact the venture’s sustainable growth rate
  - The important lesson for now is that the entrepreneur's financing decision can have a dramatic effect on the growth rate the venture can achieve and the speed with which it can reach its target

- Growing faster than g* requires
  - additional equity investment
  - more use of debt (leverage)
    - Because the venture is expected to generate taxable income immediately, using some debt might be preferred to raising outside equity
  - a higher retention ratio

Growth and financial needs

- Product market growth that is either too rapid or too slow is not sustainable and is problematic for an entrepreneur
- Growth that is too slow threatens venture survival: this threat comes from competition in the product market
- Growth that is too rapid threatens both control and survival: this threat comes from the capital market
- Long run survival depends on achieving a level of sales that is sufficient for financial viability
- There are countless examples of rapid growth ultimately destroying a venture. There are other examples where the venture survives, but growth results in a loss of control from entrepreneur
- The challenge is to identify and implement a viable product-market strategy that produce value for the entrepreneur

Planning for product-market uncertainty

- The financial planning process begins with tentative selection of a product-market strategy that includes a growth objective
- Financing considerations can lead the entrepreneur to reject what may appear to be the best product-market strategy in favour of one that is expected to be less effective in the product market but more valuable for the entrepreneur
- Financial slack is liquidity that would enable the venture to deal with surprises without the need to raise additional capital
- It is available in various form, including, for example, cash flow from operations, excess cash or other liquid assets, or an unused line of credit

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Planning for product-market uncertainty

- Growth and profitability are not equivalent
- If a venture is profitable and, more important, is generating cash in excess of capital replacement requirements, it can finance growth internally. This is the lesson of the sustainable growth model
- Excess operating cash flow is an important source of investment capital
- The larger the gap between actual growth and sustainable growth, the greater the need for external funding
- Free cash flow is the excess of cash flow over the amount that reasonably is required to deal with uncertainty
- To achieve maximum value for investors, a venture that generates free cash flow should distribute the surplus funds in dividends, debt repayment and share repurchase

Planning for product-market uncertainty

- Some loan contracts and some equity financing structures can limit the venture's ability to raise funds in the future: the entrepreneur, accepting this clauses, can lower apparent cost of financing
- But if the venture grows rapidly or runs into difficulties, those earlier decisions can be a significant threat
- So, before committing to such provision, the entrepreneur should assess the implications if the venture grows at a different rate than expected
- A serious problem arises if unexpected poor performance is encountered before the organization has reached financial viability. In this case the venture probably has not met expectations and will have difficulty raising capital
- A forward-looking entrepreneur can manage the risk by maintaining financial slack and preserving the ability to raise additional capital in the event growth is slower than expected

Cash flow breakeven analysis

- For assessing financial needs, cash flow breakeven analysis can provide insight
- Cash flow breakeven analysis addresses the question, “What level of sales generates operating cash inflows that are sufficient to cover operating cash outflows?”
- The cash flow breakeven point is where the venture achieves a level of sales high enough to maintain its operations at the current level, without additional investment
- Finding the cash flow breakeven point helps the entrepreneur assess initial financing needs. Once a breakeven model is constructed, the entrepreneur can use it to determine how initial cash needs depend on sales levels, sales growth, product prices, fixed costs, and noncash revenue and expenses
- Breakeven analysis can be used to conduct a variety of “what if” or sensitivity analyses

Cash flow breakeven analysis

- Traditional accounting approach to breakeven analysis
  - ignores the time value of money
  - focuses on accounting net income rather than cash flow

- Cash flow breakeven point (BEP)
  - operating cash inflows cover cash outflows
  - sales are high enough to maintain operations at the current level, without additional investment
  - growth beyond the BEP requires additional capital

Cash flow breakeven analysis

- Cash flow breakeven analysis considers financial needs in a different way:
  - on one level, the technique helps determine the level of sales a venture must achieve to finance its operations from cash flow
  - on another level, by combining cash flow breakeven analysis with a sales forecast, the entrepreneur can estimate the investment needed to sustain the venture until the breakeven point is reached

Cash flow breakeven analysis - Illustration

- Gill Bates' on-line virtual world, *iFree*
- Two revenue sources
  - subscription
  - advertising
- Advertising revenue and variable costs vary non-linearly as the number of users increases

  $\Rightarrow$ changing contribution margin
- Fixed asset investment
  - $300,000 up-front
  - $20,000 annually

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iFree example

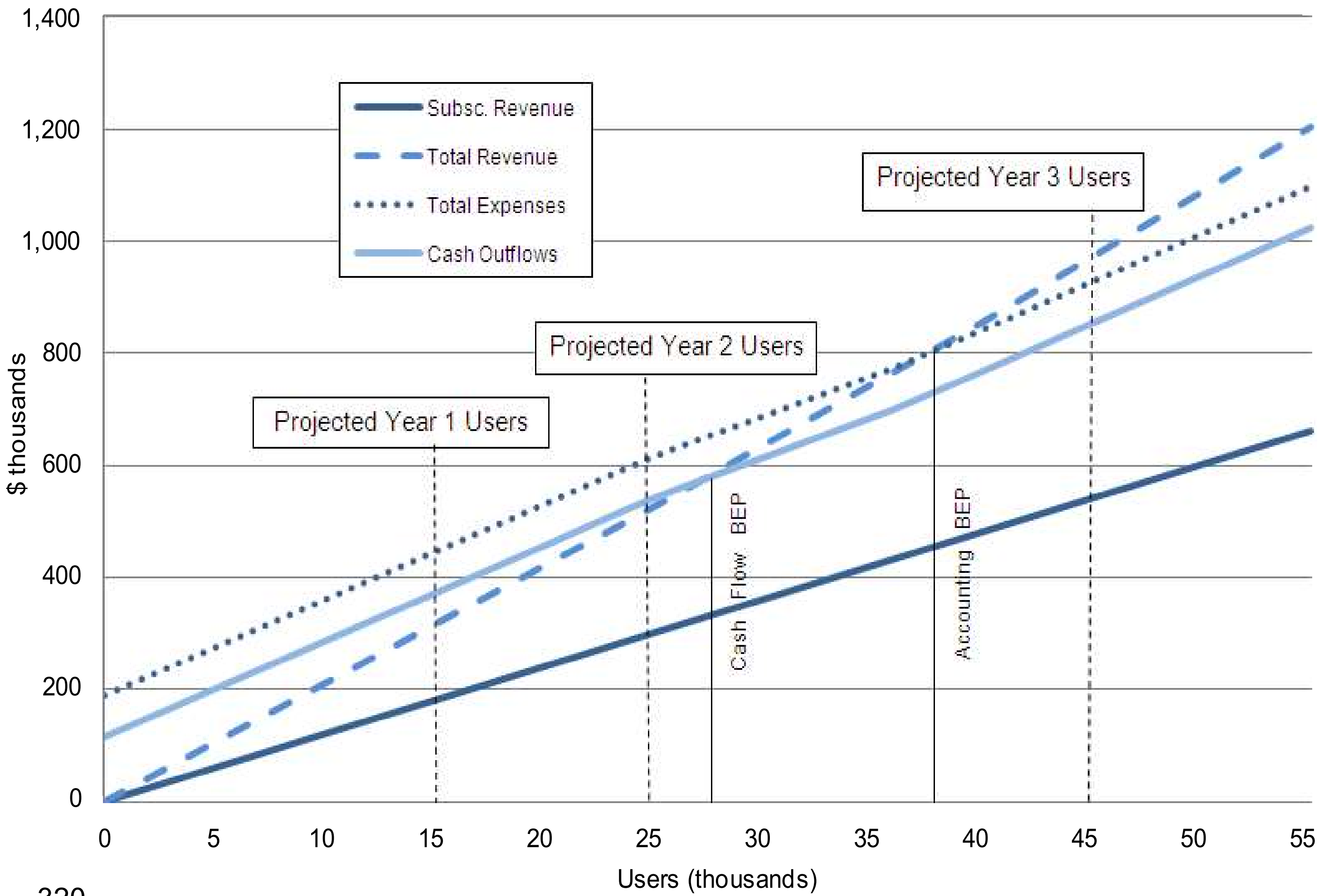
Revenue and Expense Assumptions of *iFree* at Various User Levels			
Number of Users (thousands)	up to 25	25-40	40 to 55
Top of Range	25	40	55
Average over All Users			
Revenue per User at Top of Range			
Subscriptions	$12.00	$12.00	$12.00
Advertising	$9.00	$9.38	$9.89
Average Total Revenue	$21.00	$21.38	$21.89
Expenses per User at Top of Range			
Average Variable Expenses	$17.00	$16.06	$15.23
Average Contribution to Operating Profit	**$4.00**	**$5.31**	**$6.66**
Average over Incremental Users			
Revenue per User			
Subscriptions	$12.00	$12.00	$12.00
Advertising	$9.00	$10.00	$11.25
Total	$21.00	$22.00	$23.25
Expenses per User			
Variable Expenses	$17.00	$14.50	$13.00
Incremental Contribution to Operating Profit	**$4.00**	**$7.50**	**$10.25**

iFree example

Pro Forma Financial Data for *iFree* at Various User Levels

Users (000s)	**0**	**25**	**40**	**55**
Total Subscription revenue	$0	$300	$480	$660
Total Advertising revenue	$0	$225	$375	$544
Total Revenue	$0	$525	$855	$1,204
Variable Expenss	$0	$425	$643	$838
Fixed Expenses	$0	$190	$190	$190
Operating profit	**$0**	**($90)**	**$23**	**$176**
Tax @ 40%	$0	$0	$9	$71
Net Income	$0	($90)	$14	$106
Plus Depreciation (nonrecurring)	$0	$75	$75	$75
Plus Depreciation (recurring)	$0	$20	$20	$20
Capital Investment/Replacement	($300)	($20)	($20)	($20)
Cash flow	**($300)**	**($15)**	**$89**	**$181**

iFree example



Cash Flow Breakeven Analysis - Illustration

- *iFree*'s accounting (Net Income) BEP is 37,000 users
- *iFree*'s cash flow BEP is 27,000 users
- Funding needs

Year 1 shortfall =	$55,000
Year 2 shortfall =	$15,000
Cumulative shortfall =	$70,000

- Does not include capital to grow beyond BEP
- PV breakeven analysis
  - PV of operating cash inflows covers PV of cash outflows

Assessing financial needs with scenario analysis

- Financing decision needs to accommodate uncertainty
- Scenario analysis is a simple way to incorporate uncertainty into projections of financial needs
- Scenario analysis can be developed in much the same way as decision tree analysis
  - expected, best, and worst case scenarios

iFree Scenario Analysis

- 18 Scenarios based on
  - the number of users
  - advertising revenue
  - variable expenses
- Estimates for four scenarios of
  - cumulative cash need
  - Year 3 net income

iFree Scenario Analysis

Growth Rate of Users [1]	Variable Cost [2]	Advertising Revenue [3]	Projected Cash Flow				Cumulative Cash Need	Year 3 Net Income
			Time 0	Year 1	Year 2	Year 3		
Expected	Expected	Expected	($300,000)	($55,000)	($15,000)	$119,000	($370,000)	$44,000
High Growth	High Cost	High Revenue						
		Low Revenue						
	Expected Cost	High Revenue						
		Low Revenue						
	Low Cost	High Revenue	($300,000)	$12,000	$98,000	$272,000	($300,000)	$197,000
		Low Revenue						
Expected Growth	High Cost	High Revenue						
		Low Revenue						
	Expected Cost	High Revenue	($300,000)	($35,000)	$19,000	$158,000	($335,000)	$83,000
		Low Revenue	($300,000)	($75,000)	($49,000)	$80,000	($424,000)	$5,000
	Low Cost	High Revenue						
		Low Revenue						
Low Growth	High Cost	High Revenue						
		Low Revenue	($300,000)	($104,000)	($96,000)	($41,000)	($541,000)	($116,000)
	Expected Cost	High Revenue						
		Low Revenue						
	Low Cost	High Revenue						
		Low Revenue						

1. Expected users are 15,000 in the first year, 25,000 in the second year, and 45,000 the third. High growth is 20 percent above these expected numbers and low growth is 20 percent below.

2. Expected variable expense and advertising are as shown in Table 8.2. High cost is variable expense 10 percent higher than expected and low cost is variable expense 10 percent less than expected for all user levels.

3. High advertising revenue is 15 percent above the expected levels in Table 8.2 and low advertising revenue is 15 percent below expected.

iFree scenario analysis

- Should the entrepreneur raise enough capital to cover the worst case outcome?
  - might be preferable to abandon the venture
  - raising all capital up front will reduce the entrepreneur's stake

Scenario	Cumulative Cash Need	Year 3 Net Income
Expected	$370,000	$44,000
Best	$300,000	$197,000
Worst	$541,000	($116,000)

How much money does the venture need?

- Three principles/assumptions to answer this question:
  - First, the entrepreneur does not need to raise capital now to cover cash needs for scenarios in which the business is thriving
  - Second, the entrepreneur does not need to raise capital now that will only be needed if the venture is unsuccessful
  - Third, the entrepreneur does not need to raise initial capital that will not be needed until after a significant milestone is passed

Using simulation to examine alternative financing arrangements

- NewCompany initial equity investment ranging from $4 million to $500,000

NewCompany Simulation Results for Alternative Initial Financing Decisions
(In each case, results are based on 10,000 iterations of the model. Initial investments are in the form of equity.)

Financing Scenario	1	2	3	4	5	6	7	8	9
Initial Equity Investment	$4,000,000	$3,000,000	$2,000,000	$1,750,000	$1,500,000	$1,250,000	$1,000,000	$750,000	$500,000
Panel A - Additional financing needed									
Total Iterations	0.79%	2.07%	8.72%	14.08%	41.94%	80.61%	95.22%	100.00%	100.00%
Development before Out of Finanancing	0.79%	2.07%	8.72%	14.08%	31.91%	70.01%	84.53%	79.28%	58.79%
Development Failed	0.00%	0.00%	0.00%	0.00%	10.03%	10.60%	9.87%	10.20%	10.08%
Net Income still Negative	0.00%	0.00%	0.00%	0.02%	15.09%	21.90%	22.47%	23.46%	24.82%
High Growth (>9%)	0.79%	2.03%	6.89%	9.84%	17.33%	24.80%	25.05%	25.08%	25.22%
Low Variable Cost (<70%)	0.04%	0.05%	0.61%	0.87%	6.83%	13.10%	21.46%	25.63%	26.46%
High Growth/Low Cost	0.04%	0.05%	0.61%	0.87%	2.97%	5.74%	6.58%	6.47%	6.35%
Low Growth/High Cost	0.00%	0.04%	1.83%	4.24%	20.75%	48.45%	55.29%	55.76%	54.67%
Panel B - No additional financing needed									
Total Iterations	99.21%	97.93%	91.28%	85.92%	58.06%	19.39%	4.78%	0.00%	0.00%
Development Failed	9.93%	9.77%	10.62%	10.18%	0.00%	0.00%	0.00%	0.00%	0.00%
Net Income still Negative	15.60%	17.04%	20.11%	19.69%	5.33%	0.03%	0.00%	0.00%	0.00%
High Growth (>9%)	24.38%	23.39%	19.11%	15.36%	8.56%	1.55%	0.11%	0.00%	0.00%
Low Variable Cost (<70%)	26.08%	26.57%	26.04%	26.72%	20.42%	13.54%	4.78%	0.00%	0.00%
High Growth/Low Cost	6.38%	6.74%	6.21%	5.91%	4.02%	1.43%	0.11%	0.00%	0.00%
Low Growth/High Cost	55.13%	54.71%	52.35%	49.75%	33.10%	5.73%	0.00%	0.00%	0.00%
Avg. Minimum Surplus Cash	$2,990,881	$1,799,846	$634,305	$370,504	$154,273	$34,054	$3,407	$0	$0
Earliest Out of Cash	Never	Never	Month 66	Month 58	Month 53	Month 48	Month 41	Month 33	Month 24

Using simulation to examine alternative financing arrangements

- $4 million is enough cash for 99.2% of the trials, but
  - 10% never have successful development
  - 16% are unprofitable in Month 78
  - 55% are Low growth/High cost outcomes

- Conclusion: $4 million is too high for initial funding because it fully funds many “bad” outcomes

Using simulation to examine alternative financing arrangements

- $500,000 is insufficient in all 10,000 trials
- With an initial investment of $1.25 million
  - 81% of the trials need additional funding
    - most are failed development (11%) or Low growth/High cost (48%) trials ⇒ might be better to abandon
  - 19% of the trials need no additional funding
    - most are low cost and profitable trials ⇒ "good" outcomes which could get funding if needed
    - some "bad" (Low growth/High cost) trials (6%)
- Conclusion: $1.25 million is enough to identify most of the "good" outcomes and reduces funding of the "bad"

Using simulation to examine alternative financing arrangements

- With an initial investment of $1.0 million
  - 95% of the trials need additional funding
    - most are failed development (10%) or Low growth/High cost (55%) trials ⇒ might be better to abandon
    - about 1% ran out of cash before development success
  - 5% of the trials need no additional funding
    - most are low cost and profitable trials ⇒ “good” outcomes which could get funding if needed
    - no “bad” (Low growth/High cost) trials
- Conclusion: $1.0 avoids funding any “bad” outcomes, but also is insufficient for a small number of “good” trials to reach development success

Assessing financial need with staged investment

- NewCompany simulation model with \$1.0 million of initial funding
- When cash runs out, additional funds are provided only if
  1. Development has been completed
  2. The expected growth rate of sales is at least 7% per month during the rapid growth phase
  3. The expected total variable cost (cost of sales plus variable SG&A) is no more than 75% of sales

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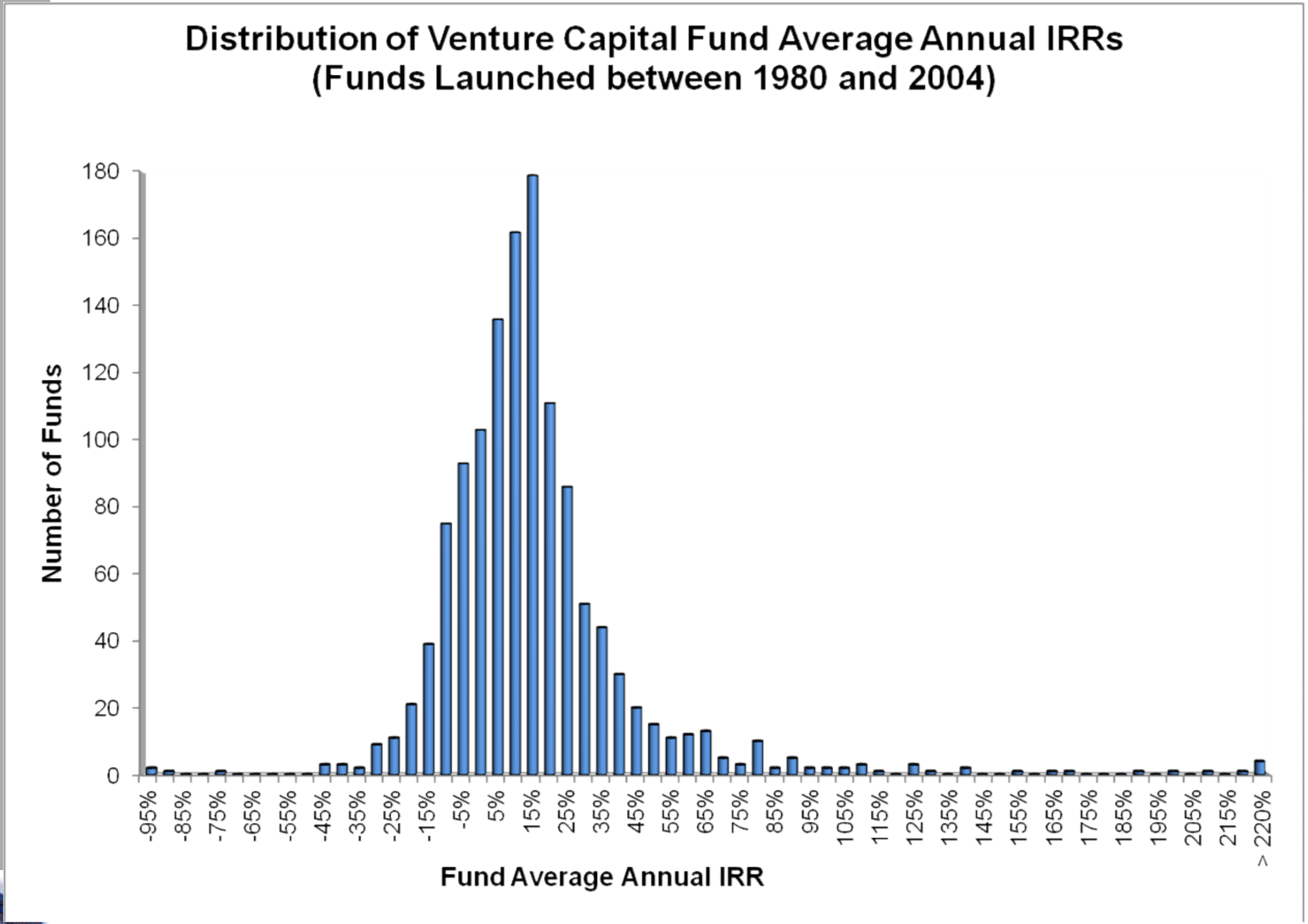
Chapter 9

FOUNDATIONS OF NEW VENTURE VALUATION

Perspectives on valuation of new ventures

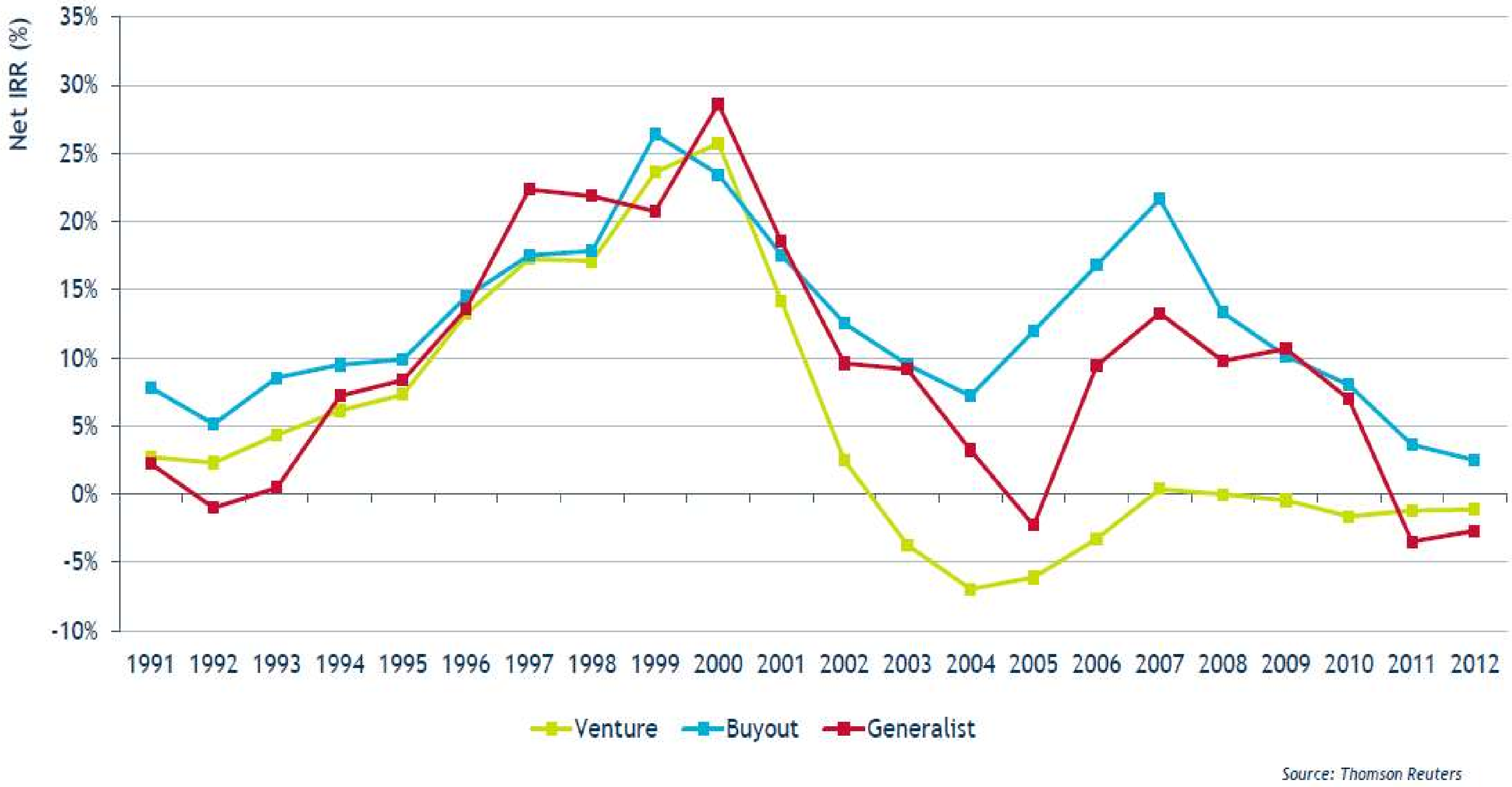
- The value of any investment depends on its ability to generate future cash flows, as well as on investor assessments of, and attitudes toward, the riskiness of the future cash flows
- Two aspects of valuation make investment decisions about entrepreneurial projects particularly difficult:
  - The future cash flows of a perspective new venture, although they are a fundamental determinant of value, are very difficult to estimate
  - The discount rates appropriate for estimating the present value of the future cash flows are very difficult to estimate
- In spite of the near impossibility of precision, earning or cash flow forecasts appear in most business plans, and forecasts are made and studied by venture capitalists and other investors who are shopping for deals


Distribution of Venture Capital Fund Average Annual IRRs
(Funds Launched between 1980 and 2004)
Number of Funds
0
20
40
60
80
100
120
140
160
180
-95%
-85%
-75%
-65%
-55%
-45%
-35%
-25%
-15%
-5%
5%
15%
25%
35%
45%
55%
65%
75%
85%
95%
105%
115%
125%
135%
145%
155%
165%
175%
185%
195%
205%
215%
> 220%
Fund Average Annual IRR

Perspectives on the valuation of new ventures

- Historical VC returns
  - average annual IRR = 13.7%
  - median annual IRR = 9.6%
  - average S&P 500 return = 10.3%
- Possible explanations for low VC returns
  - unfortunate timing, bad luck, lack of skill or access to deal flow, and unforeseeable negative events
- Two other important reasons
  - valuation mistakes
  - deal structuring mistakes

Five-year rolling IRRs (Funds formed 1980-2012)



The many uses of valuation

- Strategic planning
  - The choice of strategy depends on how each alternative contributes to value
- Estate planning
  - Estate tax liabilities depends on market value. For a nonpublic venture, market value must be estimated
- Partnership formation and dissolution
  - The fractional interest that is assigned to a new partner is likely to depend on a valuation, and partnership agreements often include reciprocal buyout provisions, where buyout offers depend on valuation
- Initial public offering (IPO)
  - The price at which new shares are offered to investors depends on the value of the venture

The many uses of valuation

- Stock options and employee stock ownership plans (ESOPs)
  - Contributions to ESOP's and the terms of stock option arrangements depend on the value of the venture
- Mezzanine financing
  - Mezzanine debt often includes equity "sweeteners", such as warrants. The value of such sweeteners depends on the value of the underlying venture
- Negotiating a merger or sale of a venture
  - The terms of exchange depend on the value of the venture and the value of financial claims that are exchanged for ownership of the venture

Myths about new venture valuation

- Myth 1: Beauty is in the eye of the beholder
- Myth 2: The future is anybody's guess
- Myth 3: Investors demand very high rates of return to compensate risk
- Myth 4: The investor determines the value of the venture

Myths about new venture valuation

- Beauty is in the eye of the beholder
  - Professional investment managers recognize the economic tradeoff between cash flow and risk and are not influenced by the “emotional consideration” of an investment
  - To the managers of investment funds, the particular product market focus of the venture is only important for what it portends for cash flows and for how the risk of the venture fits into the investor’s portfolio
- The future is anybody’s guess
  - Often is argued that an entrepreneurial venture faces too many unknowns to predict revenues with any precision. Forecasting cash flows is even more challenging
  - But, it is important to try to understand the extent and nature of the uncertainty
  - Scenario analysis and simulation are of considerable practical value for understanding and dealing with the risk and for valuing the venture

Myths about new venture valuation

- Investors in new ventures demand very high rates of return to compensate for the risks they are taking
  - New ventures are high-risk investments that tie up the investor's capital for several years, with no easy means of exit
  - The evidence of actual returns from investing in new ventures suggests that the typical returns are in the mid to high teens (13 – 18%)
  - Higher rates can be found for short periods, but the overall performance is nothing like the 30 to even as high as 100% returns that are often mentioned
  - The very high rates of return sometimes are sought by investors when they evaluate individual projects

Myths about new venture valuation

- The outside investor determines the value of the venture
  - Some writers contend that it is pointless for the entrepreneur to undertake a valuation. They argued that investors do not accept the entrepreneur's valuation anyway, so the entrepreneur's efforts are better spent in other ways
  - It is true that outside investors commonly prepare their own valuation based on their own research and assumptions
  - In the context of a financing negotiation, valuation is important to the entrepreneur for three reason:
    - The entrepreneur can better understand how the venture is likely to be valuated by prospective investors
    - The entrepreneur can better understand what the venture should be worth to him/herself and how that differs from value to the investor
    - The entrepreneur needs to understand how alternative deal structures affect overall value and the values of the financial claims of the investors and the entrepreneur

Hurdle rates for venture capital

Stage	*Annual ROR (%)*	*Total expected holding period (years)*
Seed and start-up	50–100% or more	More than 10
First stage	40–60	5–10
Second stage	30–40	4–7
Expansion	20–30	3–5
Bridge and mezzanine	20–30	1–3
LBOs	30–50	3–5
Turnarounds	50+	3–5

Source: Timmons, J. A., and S. Spinelli, Jr. 2007. *New Venture Creation: Entrepreneurship for the 21st Century. 7th ed. Chicago: McGraw-Hill Irwin*

An overview of valuation methods

- The value of any investment is the present value of its future cash flows
- Valuation is guided by two fundamental principles:
  - A dollar today is worth more than a dollar received in the future
  - A safe dollar is worth more than a gamble with an expected payoff of one dollar
- Thus, the present value of any investment depends on the timing of expected cash flows and on the riskiness of the cash flows

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An overview of valuation methods

- Discounted cash flow (DCF)
  - the risk-adjusted discount rate (RADR) approach
  - the certainty equivalent (CEQ) approach
- Relative value (RV)
- The venture capital (VC) method
- The First Chicago method

The discounted cash flow method

- RADR: discount rate reflects riskiness of cash flows and the time value of money
  - commonly used in corporate finance
- CEQ: cash flows are adjusted for risk and then discounted at the risk-free rate
  - easier to implement than RADR for new ventures
- Same result with consistent assumptions

The relative value (RV) method

- Uses market data on comparable companies or transactions
  - dimensions of comparability include industry, business model, stage, size, and accounting ratios
- Ventures with similar cash flows and risks should have the same value
- Widely used for exit strategy valuations
  - IPO
  - acquisition

The venture capital method

- Popular in the private equity/VC arena
- Combines elements of DCF and RV methods
- Based on a successful exit
- Use a high discount rate to capture
  - time value
  - risk
  - bias of using success-scenario cash flows
  - dilution from subsequent financing rounds

The First Chicago method

- Simplified DCF approach which mitigates some of the problems with the VC method
- Uses cash flow estimates for probability-weighted scenarios
- More realistic discount rate
- Requires analyst to consider possible outcomes for the venture and their probabilities

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An overview of valuation methods

- The RADR method
  - It is used most commonly in corporate finance (the information requirements are satisfied by using data on comparable public firms)
  - An expected future cash flow is converted to present value by applying a discount rate that reflects both the time value of money and the riskiness of the future cash flow
  - For a particular project (j), that yields an uncertain cash flow at time (t), the appropriate discount rate for valuing the expected cash flow can be stated as follows:

$$r_{jt} = r_{Ft} + RP_{jt}$$

r_{Ft} is the required rate of return for investing in a risk−free asset

RP_{jt} is a risk adjustment to the discount rate. It depends, in some fashion, on the riskiness of the future cash flow

An overview of valuation methods

- RADR discount rate is the opportunity cost the investor could earn on an alternative investment with the same expected return and risk
- To use the RADR method, you must be able to forecast expected future cash flows, estimate the risk-free rate, and estimate the appropriate risk premium to include in the discount rate
- The primary impediment to using the RADR method for valuing a new venture is that the appropriate risk premium is difficult to estimate, particularly if public market data for comparable projects is not available
- The present value, PV_j, of an investment that offers a series of expected future cash flows, C_{jt}, is given as:

$$PV_j = \sum_t \frac{C_{jt}}{(1+r_t)^t}$$

Identifying relevant cash flows

- The cash flows to include in a valuation are the cash flows the investor can expect to receive in exchange for investing
- The asset is being valued may be the entire venture, or it may be a particular financial claim on the venture, such as common stock, preferred stock, debt, or an option
- In a valuation conducted on behalf of an individual who is involved in the venture, relevant cash flows include the value of expected compensation, to the extent that the value of the compensation exceeds the value of expected compensation in the best alternative employment
- When an investor in a venture takes a managerial or advisory role, the cash flows to be valued should be adjusted for the opportunity cost of the investor's time
- For valuation, it is important that the relevant cash flows be identified correctly

DCF valuation – RADR approach

- Identifying relevant cash flows
- Cash flows an investor expects to receive in exchange for investing
  - equity ⇒ dividends
  - debt ⇒ interest and principal payments
  - some securities may have elements of both
    - preferred stock
    - convertible bond
- Explicit value and continuing value

DCF valuation – RADR approach

- The measure of risk: three equally-likely outcomes

State of the economy	*Dividend (D_1)*	*Price (P_1)*	*Dividend yield*	*Percent appreciation*	*Total return*
Good	\$2.00	\$24.00	10%	20%	30%
Average	\$1.00	\$22.00	5%	10%	15%
Bad	\$0.00	\$18.00	0%	−10%	−10%

- Expected holding-period return

  $= [(30\% \times 1/3) + (15\% \times 1/3) + (-10\% \times 1/3)]$

  $= 11.67\%$

- Standard deviation of holding-period return

  $= [(30\% - 11.67\%)^2 \times 1/3 + (15\% - 11.67\%)^2 \times 1/3 + (-10\% - 11.67\%)^2 \times 1/3]^{0.5}$

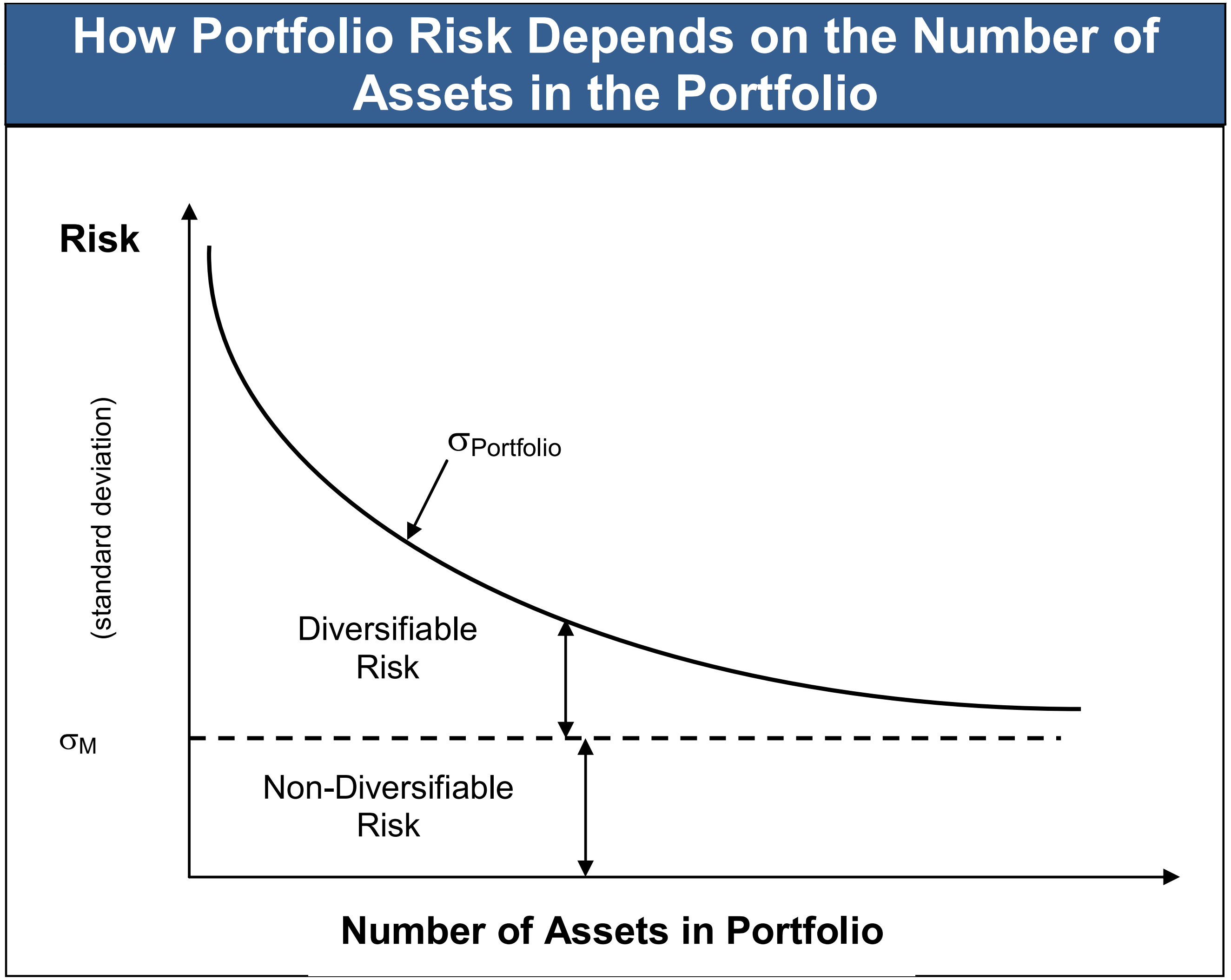
  $= 16.5\%$

DCF valuation – RADR approach

- Investors price for bearing risk – assumptions:
  - there is active competition to invest capital in new ventures
  - investors view new venture investing as an alternative to other investment opportunities
  - investors assess project risk based on its contribution to the risk of a diversified portfolio
  - illiquidity does not affect the investor's valuation of new venture investment

- Allow us to distinguish two types of risk
  - market, systematic, or non-diversifiable
  - firm-specific, idiosyncratic or diversifiable

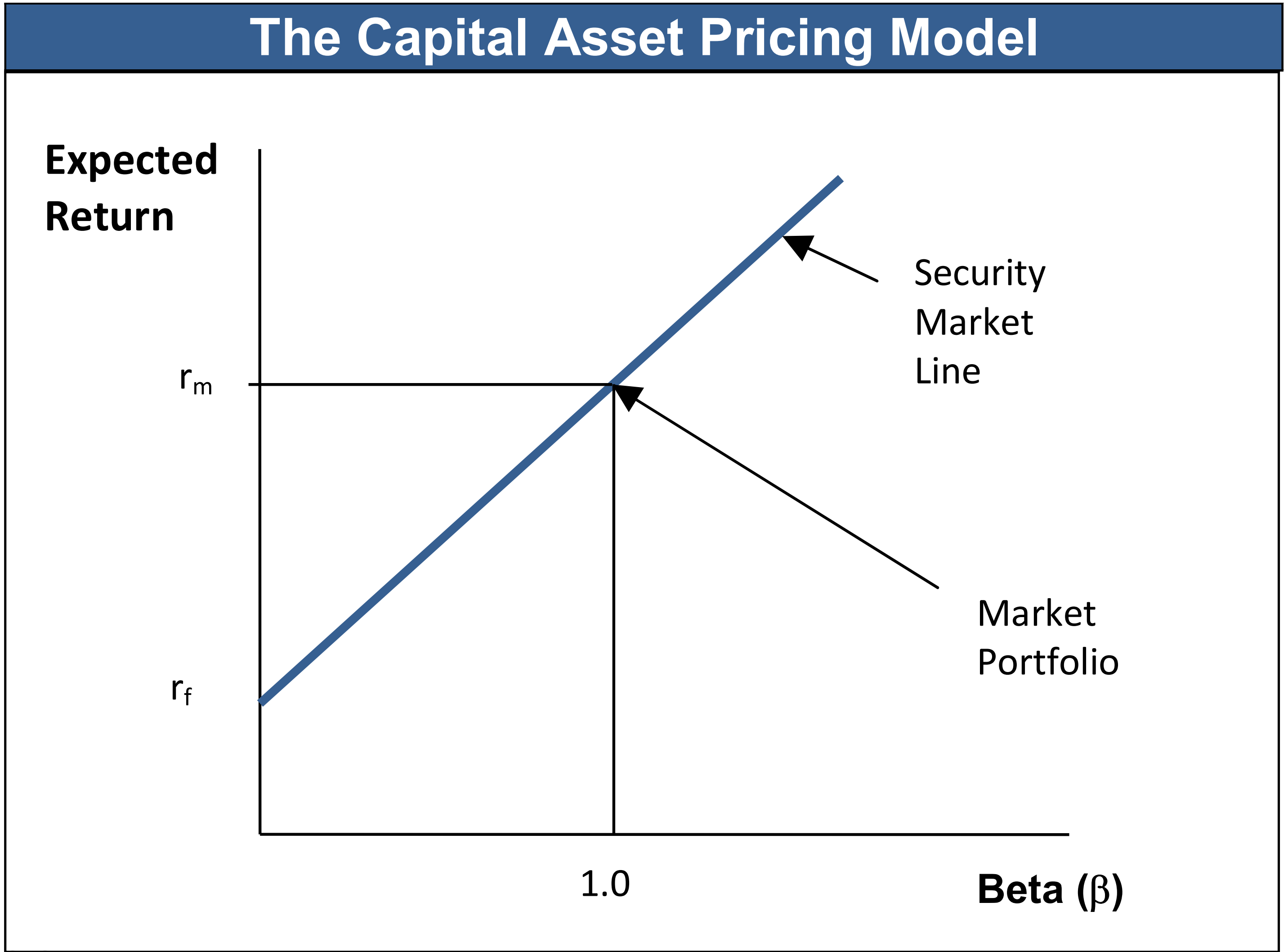
Diversification



Portfolio theory and the CAPM

- The total risk of the portfolio is composed of diversifiable (non systematic) and non diversifiable (systematic) risk
- By holding more securities, diversifiable risk approaches zero
- Thus, total risk approaches the risk of the market
- An investor can diversify by investing in a stock market fund that is designed to match the performance of a standard market index
- The non diversifiable component of risk is known as beta risk, or market risk
- The risk free asset, by definition, has no risk and therefore no beta risk
- Different portfolios, with different amounts of total risk, but equal amounts of beta risk, have the same expected return

CAPM



The Capital Asset Pricing Model
Expected Return
r_m
r_f
Security Market Line
Market Portfolio
1.0
Beta (β)

Portfolio theory and the CAPM

- The market risk premium is the difference between the expected return on the market portfolio and the return on the risk free asset
- The algebraic description of the CAPM is

$$r_j = r_F + \underbrace{\beta_j \times \overbrace{(r_M - r_F)}^{market\ risk\ premium}}_{risk\ premium}$$

- The value of the beta risk on the asset j, depends on its non diversifiable risk

$$\beta_j = \frac{\sigma_{jM}}{\sigma^2{}_M} = \frac{\rho_{jM} \times \sigma_j}{\sigma_M}$$

σ_{jM} is the covariance of holding period returns of asset j with the market

ρ_{jM} is the correlation coefficient of holding period returns

Portfolio theory and the CAPM

- Given its focus on non diversifiable risk, the CAPM is appropriate when investors are able to diversify at low cost
- Public corporations may not be diversified, but the investors who own their shares are free to diversify their investments
- Other kinds of investors in new ventures may find diversification more difficult to achieve: in particular, private corporations and high-net-worth individuals are normally not well diversified. But they cannot expect to be compensated for under diversification

DCF valuation – Certainty equivalent approach

The challenge of using the RADR approach

- Consider a wager that pays either \$1 or \$2 with equal probability
  - expected return is $[(\$1 \times 0.5) + (\$2 \times 0.5)] = \$1.50$
  - standard deviation of cash flows is
    $[(\$1 - \$1.50)^2 \times 0.5 + (\$2 - \$1.50)^2 \times 0.5]^{0.5} = \$0.50$
- To use the RADR approach we need the standard deviation of holding period returns

DCF valuation – Certainty equivalent approach

The challenge of using the RADR approach

- What if it costs \$1.25 to acquire the wager?
  - \$1 payoff is a -20% return and a \$2 payoff is a 60% return
  - expected holding-period return is
    $[(-20\% \times 0.5) + (60\% \times 0.5)] = 20\%$
  - standard deviation of holding period return is
    $[(60\% - 20\%)^2 \times 0.5 + (-20\% - 20\%)^2 \times 0.5]^{0.5} = 40\%$

DCF valuation – Certainty equivalent approach

The challenge of using the RADR approach

- But, what if the cost of the wager is $1.50
  - $1 payoff is a -33% return and a $2 payoff is a 33% return
  - expected holding-period return is
    $[(-33\% \times 0.5) + (33\% \times 0.5)] = 0\%$
  - standard deviation of holding period return is
    $[(-33\% - 0\%)^2 \times 0.5 + (33\% - 0\%)^2 \times 0.5]^{0.5} = 33\%$

$\Rightarrow$ The standard deviation of holding period returns depends on the cost of the wager

Difficulties of using the RADR method

- To value expected cash flows – using the conventional RADR form of the CAPM – you need to know the discount rate, but the discount rate depends on the standard deviation of holding-period returns, which in turn depends on the value of the project
- In corporate setting, it is customary to finesse the problem by analogizing the investment decision to an existing market asset that is publicly traded
- If that can be done, a two-step approach can be used:
  - First, estimate the beta of the market asset
  - Second, discount the project cash flows using that beta
- Unfortunately, convincing analogies are hard to find if the project is a new venture or a financial claim on a new venture

An overview of valuation methods

- The CEQ method
  - In this method, instead of adjusting the discount rate, the risk adjustment is made directly to the cash flow
  - Then the risk adjusted (or certainty equivalent) cash flow is converted to present value by discounting at the risk-free rate
  - The certainty equivalent cash flow (CE_{jt}) can be described as follows:

$$CE_{jt} = C_{jt} - RD_{jt}$$

C_{jt} is the expected future cash flow of asset j at time t

RD_{jt} is the dollar−valued discount to C_{jt} that is required to convert the risky expected cash flow to its certainty equivalent

An overview of valuation methods

- The CEQ method
  - To use the CEQ method, it is necessary to forecast the expected future cash flow and the risk-free rate, r_{Ft}
  - It is necessary to estimate the dollar-valued risk discount to apply to the expected cash flow
  - For new venture it is often easier to estimate the dollar-valued risk discount than the percentage risk premium
  - The present value, PV_j, of an investment that offers a series of expected future cash flows, C_{jt}, is given as:

$$PV_j = \sum_t \frac{C_{jt} - RD_{jt}}{(1 + r_{Ft})^t}$$

DCF valuation – Certainty equivalent approach

- Although the certainty equivalent approach to valuation is general in that it does not impose any particular trade-off between risk and return, the CAPM can be restated in certainty equivalent form by solving the previous equation for PV_j

$$PV_j = \frac{C_j - \dfrac{\rho(C_j, r_M) \times \sigma_{C_j}}{\sigma_M} \times (r_M - r_F)}{1 + r_F}$$

- The numerator is the CAPM-based certainty equivalent of the risky cash flow C_j
- The denominator is a discount factor that is used to determine the present value of a riskless cash flow
- When the certainty equivalent form of the CAPM is used to value the project, the risky cash flow is adjusted by a factor that makes the present value of the cash flow equivalent to that derived by discounting the risky cash flow at the appropriate risky rate

DCF Valuation
Certainty equivalent approach

- Let's revisit the wager that pays either \$1 or \$2 with equal probability with the following assumptions:
  - risk-free rate is 4.0%
  - market risk premium is 6.0%
  - standard deviation of holding-period returns of the market portfolio is 20%
  - correlation between the payoff of the bet and the market portfolio 0.6

$$PV_j = \frac{\$1.50 - \dfrac{0.60 \times \$0.50}{0.20}(0.06)}{1 + 0.04} = \frac{\$1.41}{1.04} = \$1.356$$

DCF valuation – Certainty equivalent approach

- CEQ cash flow of the expected (risky) \$1.50 is \$1.41
- Discounting at the risk-free rate give a PV of \$1.356
- If it costs \$1.25 to acquire the wager, the NPV is

  NPV = (\$1.356 - \$1.25) = \$0.106

- With a PV of \$1.356, the correct discount rate is

  $(C_j/PV_j) - 1 = \$1.50/\$1.356 - 1 = 0.1062 = 10.62\%$

The relative value (RV) method

- You are considering the purchase of a three-bedroom, 2,500-square-foot house with an asking price of $450,000 and assessed at $439,000

- You collect the following data on comparable sales:

Comparable transaction	*Square feet*	*Bedrooms*	*Assessed value*	*Selling price*
House A	1,800	2	$330,000	$375,000
House B	2,100	3	$429,000	$422,000
House C	3,050	4	$500,000	$515,000

The relative value (RV) method

Comparable	Selling Price	Price/ Sq. Ft.	Price/ Bedroom	Price / Assessed Value
House A	$375,000	$208.3	$187,500	1.14
House B	$422,000	$201.0	$140,667	0.98
House C	$515,000	$168.9	$128,750	1.03
Average		**$192.7**	**$152,306**	**1.05**

$$MV\,Est._{Subject} = \frac{Avg.\,MV}{Sq.\,Ft.}_{Comps} \times Sq.\,Ft._{Subject} = \$192.7 \times 2{,}500 = \$481{,}750$$

$$MV\,Est._{Subject} = \frac{Avg.\,MV}{Bedroom_{Comps}} \times No.\,of\;Bedrooms_{Subject} = \$152{,}306 \times 3 = \$456{,}918$$

$$MV\,Est._{Subject} = \frac{Avg.\,MV}{Assessed\,Value_{Comps}} \times Assessed\,Value_{Subject} = \$1.05 \times \$439{,}000 = \$460{,}950$$

The relative value (RV) method

Relative valuation and new ventures

- Accounting-based approaches
  - equity value
    - Price/earnings, price/BV of equity, price/cash income
  - enterprise value (EV)
    - EV/EBITDA, EV/revenue, EV/BV (equity + debt)

- Incorporating growth expectations
  - PEG ratio (P/E to growth)
  - EV/(EBITDA/growth)

- Non-accounting-based approaches

Valuation by the venture capital method

Step 1:

Select a terminal year for the valuation by determining a point where harvesting would be feasible

Step 2:

Use the appropriate P-E or other and cash flow projection to compute continuing value

Step 3:

Convert the continuing value estimate to present value by discounting at a hurdle rate

Step 4:

Compute the minimum fraction of ownership an investor would require for a given investment

Valuation by the First Chicago method

Step 1:
Select a terminal year for the valuation based on likely harvest date in the event of success

Step 2:
Estimate the cash flows

Step 3:
Compute the continuing value by applying a multiplier to the financial projection

Step 4:
Compute the expected cash flow by weighting each scenario

Step 5:
Compute PV by discounting the expected CFs

Step 6:
Compute the minimum fraction of ownership an investor would require

Valuation by the First Chicago method

- The benefit of the First Chicago method include:
  - Use of discrete scenarios is a simple and easy method of determining both risk and expected return
  - The intent is to value expected cash flows
  - The intent is to discount the cash flows at an estimate of opportunity cost of capital
  - Because information about total risk is derived, the method provides a basis for valuing complex financial claims

- The disadvantages are:
  - Discrete scenarios discard information about the risk that could be useful, especially for valuing complex claims
  - No guidance is provided about how to determine the discount rate/rates to be used in the valuation

Reconciliation with the pricing of options

- In the Black-Scholes Option Pricing Model (OPM), value increases with greater risk

- Applying the OPM to new venture valuation
  - OPM assumes complete market and continuous trading
    - reasonable for public companies, but not new ventures
    - substituting a “tracking portfolio” for the new venture probably underestimates the risk due to diversification
  - a new venture typically has numerous complex and interrelated real options, which can make using the OPM impractical

Required rates of return for investing in new ventures

- CAPM says that only market risk matters
- Much of the risk in new ventures is diversifiable (firm-specific)
  - a single biotech firm is like a lottery ticket
  - portfolio of 100 biotech firms has a beta of 0.75
  - betas for new ventures are in the 1.0-2.0 range
- With a 4% risk-free rate and 8% market risk premium the CAPM suggests returns between 12% and 20%

Required rates of return for investing in new ventures

- Can we reconcile CAPM returns with VC returns?

$$r_{\text{proj}}^{\text{VC}} = r_F + \beta_{\text{proj}}(r_M - r_F) + \text{Effort} + \text{Illiquidity}$$

- If gross VC returns are 25-30%, the GP will take a 2.5% management fee and 20% of the gains (for effort)
- This implies a negligible return for illiquidity, which is supported by recent empirical evidence
- CAPM reasonably estimates *actual* VC returns

Matching cash flows and discount rates

- Valuation cash flows are tied to specific financial claims
- What is being valued?
  - debt
  - equity
  - enterprise
- Discount rates should match the cash flows and also account for capital structure and taxes

Measures of Expected Cash Flow

<u>Cash Flow to All Investors</u> (both stockholders and creditors)

Cash Flow to All Investors = EBIT – Actual Taxes + D&A – Δ NWC – Δ Fixed Assets

<u>Cash Flow to Creditors</u>

Debt Cash to Creditors = Expected INT + Expected Δ Debt

<u>Cash Flow to Stockholders</u> (residual, in light of expected cash flows to creditors)

Cash Flow to Stockholders = EBIT – Actual Taxes + D&A – Δ NWC – Δ Fixed Assets – Expected INT – Expected Δ Debt

<u>Unlevered Free Cash Flow</u> (as if financed with no debt)

Unlevered Free Cash Flow = EBIT – Theoretical Taxes without Debt + D&A – Δ NWC – Δ Fixed Assets

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EBIT = Earnings Before Interest and Taxes, or Operating Profit

D&A = Depreciation and Amortization   Δ Fixed Assets = Change in Fixed Assets = Capital Expenditures

Δ NWC = Change in Net Working Capital = NWC Investment

INT = Interest Payments   Δ Debt = Net Change in Debt Financing = Principal Payments on Outstanding Debt – Proceeds from New Debt

Matching Cash Flows to Discount Rates for Various Financial Claims

Financial Claim	**Discount Rate**	**Discount Rate Formula (CAPM)**	**Comment**
Cash Flows to All Investors	Unlevered Cost of Equity	$r_A = r_F + \beta_A(r_M - r_F)$	The required rate of return on assets, or the unlevered cost of equity, is used to value cash flows that are expected to be received by all claimants given the target capital structure. The effect of tax deductibility of interest payments is reflected in the cash flows.
Cash Flow to Creditors	Cost of Debt	$r_D = r_F + \beta_D(r_M - r_F)$	The cost of capital for debt depends on the extent to which debt service payments are subject to market risk.
Cash Flow to Stockholders	Cost of Equity	$r_E = r_F + \beta_E(r_M - r_F)$	The cost of capital for equity depends not on the total risk of equity, but on the market component of the risk.
Unlevered Free Cash Flow	Weighted Average Cost of Capital	$WACC = (D/V)(1-t_c)r_D + (E/V)r_E$	The Weighted Average Cost of Capital (WACC) is used to value hypothetical cash flows as if the venture were financed entirely with equity. *D* and *E* are market values of debt and equity, *V* = *D* + *E*. The tax benefit of debt financing is an adjustment to the cost of debt capital.*

r_A = Return on Assets *r_D = Return on Debt* *r_E = Return on Equity*

WACC = Weighted Average Cost of Capital

β_A = Asset Beta *β_D = Debt Beta* *β_E = Equity Beta*

r_F = Risk Free Rate *r_M = Expected Return on the Market* *$(r_M - r_F)$ = Market Risk Premium*

t_c = Corporate Tax Rate

D/V = Market Value Debt / Total Firm Value (Debt + Equity) *E/V = Market Value Equity / Total Firm Value (Debt + Equity)*

Chapter 10

VALUATION IN PRACTICE

Criteria for selecting a new venture valuation method

- Discounted cash flow methods often are the only feasible approaches
  - Is the method based on expected cash flows?
    - Approaches that are not based on expected cash flows often are more convenient but can yield erroneous estimates of value
  - Is cost of capital used as the discount rate?
    - Discount rates based on total risk rather then non-diversifiable risk can lead to rejecting projects that should be accepted by an investor who is well diversified
  - How important is dealing with cash flows that vary in risk?
    - Models that do not distinguish among cash flows that differ in risk can produce distorted estimates of value

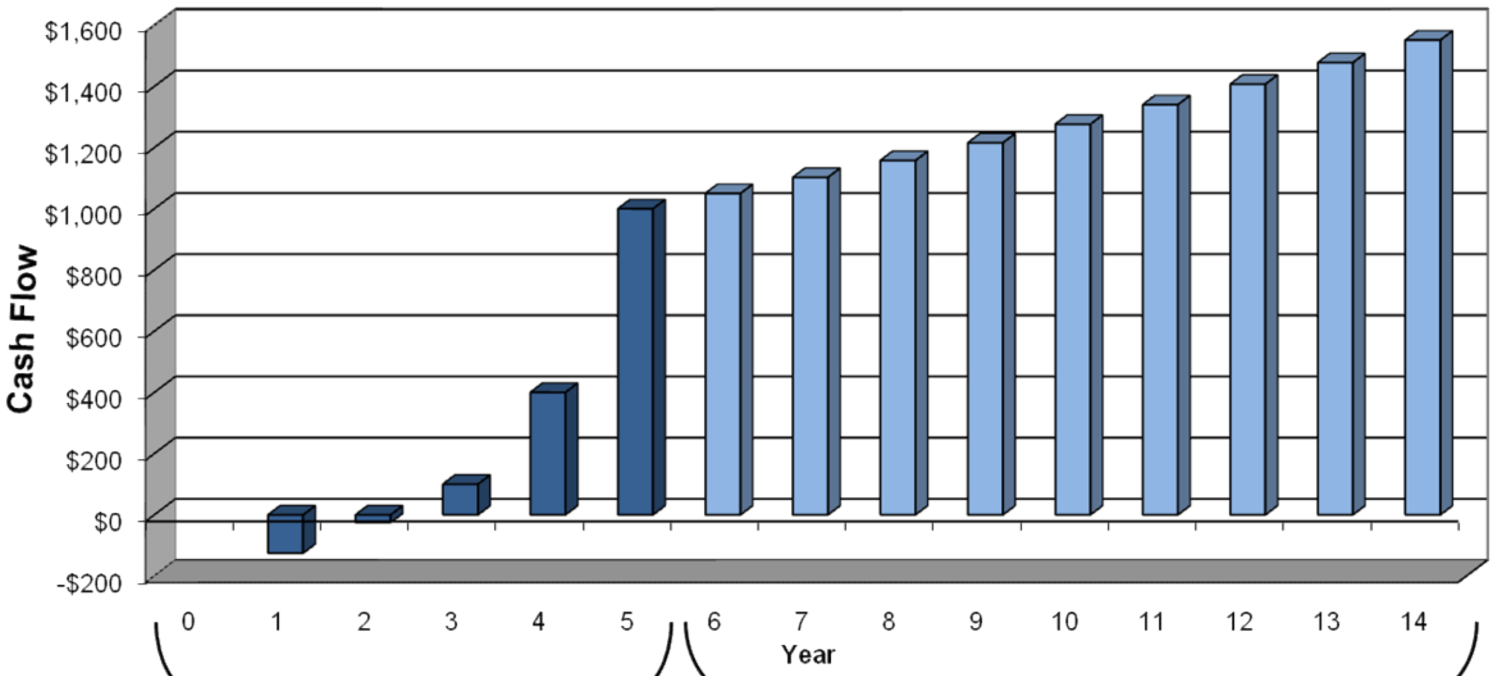
Criteria for selecting a new venture valuation method

- How important are embedded options and complex financial claims?
  - Choosing a financial structure that includes real or financial options can alter the overall value of a venture. The value of the options depend both on expected cash flows and risk of the option cash flows
- How difficult is the method to use?
  - Valuation approaches that are complex or difficult to use are sometimes too costly to justify
- What are the information requirements?

Using continuing value instead of explicit cash flow projections

- Identify the "explicit value period" and the "continuing value period"
- Estimate cash flows in the explicit value period
- Decide which multiplier (sales, earnings, etc.) to use for continuing value
- Forecast the multiple at the end of the explicit value period, using an appropriate method and data
- Estimate continuing value using the multiple

Using Continuing Value to Estimate the Worth of a New Venture



Explicit Value Period - Compute the present value of each periodic cash flow.

Continuing Value Period - Estimate the continuing value of the stream as of year five, and then convert the continuing value to present value.

Using the continuing value concept

- A common feature of all discounted cash flow approaches to new venture valuation is that cash flows after the first few years are valued implicitly
- In the first period explicit cash flow projections are made for each year (quarter, month,…)
- After the explicit value period, it is common to estimate a continuing value
- Normally, continuing value is estimated based on the historical values (e.g.: the average price/earning ratio) of market assets similar to the one being valued
- Sometimes continuing value is referred to as terminal value
- The rationale for "terminal value" is that it is a valuation at a point where existing investment could reasonably be "terminated" by sales to others

Using the continuing value concept

- Normally the continuing value period begins when the venture is projected to reach a stable pattern of future growth
- The following equation describes the value of a venture in terms of explicit and continuing value components, based on annual data

$$PV = \sum_{t=1}^{T} \frac{C_t}{(1 + r_t)^t} + \frac{CV_T}{(1 + r_T)^T}$$

PV is the present value of the venture

C_t is the annual cash flow in each year t

CV_T is continuing value as of the last year of the explicit period T

r_t is the discount rate for year t cash flows

Estimating continuing value

- Continuing value is estimated by applying multipliers or capitalization factors to aspects of the explicit forecast
- Multiples of operating cash flow, net income, sales, or assets are most often used
- Because present value depends on future cash flows, it may seem obvious that a cash flow multiple is the best one to use
- Continuing value is sometimes estimated on the basis of sales or asset multiples because these elements at the end of the explicit value period bear a strong relationship to expected future cash flows over the continuing value period than does cash flow at the end of the explicit value period
- If the venture is subject to cyclical variability, the estimate of value is more reliable if the multiplier is derived from data that have been normalized, and where the resulting multiplier is applied to a normalized estimate for the venture

Estimating continuing value

- By applying appropriate assumptions to a forecast of cash flow in the last year – for example – of the explicit value period, you can determine the cash flow multiplier that is correct analytically
- If the financial projections are positively biased, then a sensible way to solve the problem is to develop a set of projections that reflect the true expectations, giving account to the risk of failure

$$V_t = \frac{C_t \times (1+g)}{r-g}$$

$$\frac{V_t}{C_t} = \frac{(1+g)}{r-g}$$

V_t is value at time t

C_t is cash flow at time t

r is the discount rate

g is the expected growth rate of cash flows

V_t/C_t is the cash flow multiplier

Implementing the continuing value concept

- Issues when using cash flow multiples
  - comparable public firm cash flows are audited
    - entrepreneur's estimates may be biased
  - survivorship bias in comparable firms

- Techniques to address these issues
  - base the continuing value estimate on multipliers from private transactions
  - adjust the public company multiplier for an estimate of the bias in the venture's accounting
  - develop a set of projections that reflects the true expectations, including the risk of failure

Implementing the continuing value concept

- Forecasting the multiple as of the continuing value date
  - current multiples may not be the best ones to use in a valuation model
    - multiples can be cyclical or change in predictable ways

Discounted cash flow methods of new venture valuation

- The venture capital method
  - It is the traditional approach of venture capital investment valuation. It is also the simplest approach
- The First Chicago method
  - It is another valuation approach that commonly is used by practitioners
- The RADR Method
  - Based on the CAPM
- The CEQ Method
  - Based on the CAPM

Implementing valuation by the RADR form of the CAPM

- Information requirements:
  - Expected cash flows
  - Risk-free rate
  - Market risk premium
  - Beta (standard deviations of asset and market returns, correlation)
    - Comparable firms
    - Public venture funds
    - Scenarios

- Estimate expected cash flows
- Estimate the risk-free rate
- Estimate the market risk premium
- Estimate beta
- Implicit estimates of cost of capital

Estimating the market risk premium

- Expected difference between the return on the market and the risk-free rate

- Three main approaches used to estimate
  - a long-term historical average
  - a risk premium that is implied by discounting a forecast of future dividends
  - a consensus estimate

Estimating the new venture beta

- General formula for beta

$$\beta_A = \frac{\mathrm{Cov}_{r_A, r_M}}{\sigma_M^2} = \frac{\rho_{r_A, r_M}\sigma_A}{\sigma_M}$$

- Various approaches to estimation
  - use betas of comparable firms
  - estimate beta from scenarios
  - use scenario analysis to estimate a cash flow beta

Using the betas of comparable firms

Step 1:

Calculate or collect equity betas and data on the capital structure (equity and total value) of the comparable firms

Step 2:

Use the follow equation to convert each equity beta to an asset beta

$$\beta_A = \beta_E \frac{E}{V}$$

Step 3:

Use the comparable firm asset betas to compute a weighted average asset beta for the new venture

Step 4:

Use the weighted average asset beta, β_A, in the CAPM to estimate r_A, the discount rate to apply to the cash flows to all investors

Beta Estimates and Market Correlations

	# of Observations	Mean β	Correlation with the Market	Standard Deviation of Returns
All Observations	2,623	0.99	0.195	1.20
Industry				
Biotechnology	501	0.75	0.149	1.04
Broadcast and Cable TV	105	0.80	0.237	0.87
Communication	247	1.16	0.215	1.20
Communication Services	407	1.02	0.241	1.04
Computer Networks	130	1.02	0.208	0.93
Computer Services	440	0.81	0.172	1.44
Catalog/Mail Order	39	1.24	0.217	1.06
Software	754	1.20	0.200	1.37
Age (Years After IPO)				
0-1 years	1,263	0.93	0.162	1.35
2-3 years	957	0.96	0.212	1.04
>3 years	403	1.27	0.259	1.14
Financial Condition				
No Revenue	102	0.82	0.165	1.19
Revenue, Negative Income	1,475	1.14	0.197	1.35
Positive Income	1,033	0.82	0.200	1.00
Employees				
0 – 25	187	0.59	0.117	1.26
26 – 100	496	0.86	0.153	1.28
Over 100	1,661	1.14	0.231	1.13

Beta estimates of recently-public firms that went public during the 1995 to 2000 period. Betas and correlations are computed using the S&P 500 index as the "market." Source: Kerins, Smith, and Smith (2004)

Estimating beta from scenarios

- A firm is seeking a $1 million investment with the following payoff scenarios

Scenario	Probability	Market return (r_M)	Project annual cash flow	Return on investment
Boom	0.3	30%	$450,000	45%
Normal growth	0.5	10%	$250,000	25%
Bust	0.2	−5%	$0	0%

Estimating beta from scenarios

Step 1:

Compute the expected return on the market portfolio

Step 2:

Compute the variance of returns on the market portfolio

Step 3:

Compute the expected return on the project

Step 4:

Compute the covariance between market and project returns

Step 5:

Compute beta as the ratio of the covariance to the market variance

Estimating beta from scenarios

Step 1. Compute the expected return on the market portfolio.

$$30\%(0.3) + 10\%(0.5) + -5\%(0.2) = 13\%$$

Step 2. Compute the variance of returns on the market portfolio.

$$(30\% - 13\%)^2(0.3) + (10\% - 13\%)^2(0.5) + (-5\% - 13\%)^2(0.2) = 1.56\%$$

Step 3. Compute the expected return on the project.

$$45\%(0.3) + 25\%(0.5) + 0\%(0.2) = 26.0\%$$

Step 4. Compute the covariance between market returns and project returns.

$$(30\% - 13\%) \times (45\% - 26.0\%) \times (0.3) + (10\% - 13\%) \times (25\% - 26.0\%) \times (0.5) + (-5\% - 13\%) \times (0\% - 26.0\%) \times (0.3) = 1.92\%$$

Step 5. Compute beta as the ratio of the covariance to the market variance.

$$\beta_A = \frac{\mathrm{Cov}_{r_A, r_M}}{\sigma_M^2} = \frac{1.92\%}{1.56\%} = 1.23$$

Estimating beta from scenarios

Assuming a 4% risk-free rate and 6.5% market risk premium, we can estimate the required return on the investment

$$r_A = r_F + \beta_A(r_M - r_F) = 4\% + 1.23(6.5\%) = 12.00\%$$

The expected cash flow is

$\$450{,}000 \times 0.30 + \$250{,}000 \times 0.50 + \$0 \times 0.20 = \$260{,}000$

Which makes the PV of the investment

$\$260{,}000 / (1+0.12) = \$232{,}143$

Shortcuts for estimating opportunity cost of capital

- Dividend discount model

$$P_0 = \frac{D_1}{r - g} \quad \text{or} \quad r = \frac{D_1}{P_0} + g$$

- Earnings/price ratio estimate
  - for firms in steady state or with few good investment opportunities

$$r = \frac{E_0}{P_0}$$

New venture valuation: An illustration

- Dylan Components Inc. (DCI) is a high-tech start-up that is seeking expansion funding

Dylan Components Cash Flow Forecast ($000)

		YEAR						
Scenario	**Probability**	**0**	**1**	**2**	**3**	**4**	**5**	**Continuing Value**
Success	0.25	($3,000)	($1,500)	$1,000	$3,000	$5,000	$9,000	$108,000
Likely	0.50	($3,000)	($1,500)	$500	$500	$500	$500	$4,000
Failure	0.25	($3,000)	($1,500)	$0	$0	$0	$0	$0
Expected Cash Flow		**($3,000)**	**($1,500)**	**$500**	**$1,000**	**$1,500**	**$2,500**	**$29,000**

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Using the RADR form of the CAPM

$$PV = \sum_{t=0}^{T} \frac{C_{jt}}{(1 + r_t)^t} = \sum_{t=0}^{T} \frac{C_{jt}}{[1 + r_{Ft} + \beta_{jt}(RP_{Mt})]}$$

- *t,* time period
- t = 0 to T is the explicit value period
- C_{jT} includes the continuing value
- β_{jt}, the riskiness of the cash flow, specific to both time period *t* and cash flow *j*

Using the RADR form of the CAPM

- Assumptions
  - risk-free rate = 4.0%
  - market risk premium = 6.5%
  - risk-free rate is used to discount Time 0 and Year 1 riskless cash flows
  - β estimated from comparable firms

Comparable	*Equity β*	*MV equity*	*Debt*
Genric, Inc.	1.9	$12.0	$4.0
Preces Systems	1.5	$24.0	$3.0
Visania Co.	1.2	$7.0	$0.0

NOTE: *All monetary values in $millions.*

Using the RADR form of the CAPM

- Equation is used to calculate asset betas

Comparable	*Equity β*	*MV equity*	*Debt*	*Asset value*	*Equity to asset value*	*Asset β*
Genric, Inc.	1.9	\$12.0	\$4.0	\$16.0	0.75	1.43
Preces Systems	1.5	\$24.0	\$3.0	\$27.0	0.89	1.33
Visania Co.	1.2	\$7.0	\$0.0	\$7.0	1.00	1.20

NOTE: *All monetary values in \$millions.*

- Average asset β is used in the CAPM

$$r_A = r_F + \beta_A(r_M - r_F) = 4\% + 1.32 \times (6.5\%) =$$

$$= 12.58\%$$

Valuation Template 1

Valuation by the RADR Method Based on Discrete Scenario Cash Flow Forecast

Project Information		YEAR					
Cash Flows ($000s)	**Probability**	**0**	**1**	**2**	**3**	**4**	**5**
Success Scenario	0.25	-$3,000	-$1,500	$1,000	$3,000	$5,000	$117,000
Expected Scenario	0.50	-$3,000	-$1,500	$500	$500	$500	$4,500
Failure Scenario	0.25	-$3,000	-$1,500	$0	$0	$0	$0
Expected Cash Flow		**-$3,000**	**-$1,500**	**$500**	**$1,000**	**$1,500**	**$31,500**

Market Information					
Risk-free Rate	4.00%	8.16%	12.49%	16.99%	21.67%
Market Rate	10.50%	22.10%	34.92%	49.09%	64.74%
Market Risk Premium	6.50%	13.94%	22.44%	32.10%	43.08%
Comparable firm beta	1.32	1.32	1.32	1.32	1.32
Estimated Cost of Capital	**12.58%**	**26.56%**	**42.10%**	**59.36%**	**78.53%**

Market Value Estimate							
Present Value of Expected CF		-$3,000	-$1,332	$395	$704	$941	$17,644
Sum of PVs	**$15,352**						

Using the relative value method

- DCI is an early-stage venture with no revenue
  - use relative value to estimate continuing value at the end of Year 5
  - The DCI "success" scenario is IPO
- Data on comparables for the success scenario

Recent IPOs

Company	Market capitalization @ IPO	Financial data (last 12 months)			CF to all investors
		Revenue	EBIT	Earnings	
Greyport Networks	\$134,125	\$89,420	\$14,420	\$5,590	\$8,770
Spectria Labs	\$10,500	\$6,180	\$1,460	\$330	\$880
Indeve Inc.	\$97,350	\$44,250	\$7,490	\$5,120	\$11,095

NOTE: *All data in \$thousands.*

Using the relative value method

- Calculate an average or weighted average IPO cash flow multiple

Recent IPOs

Company	*Market capitalization @ IPO*	*CF to all investors*	*Market capitalization / CF to all investors*
Greyport Networks	$134,125	$8,770	15.3
Spectria Labs	$10,500	$880	11.9
Indeve Inc.	$97,350	$11,095	8.8
			Average = 12.0

- Continuing value = CF multiple x DCI Year-5 $CF_{success}$ = 12.0 x $9 million = $108 million

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Using the relative value method

- "Likely" scenario exit for DCI is a strategic acquisition (M&A)

- Data on comparables for the likely scenario

Recent M&A transactions

			Target financial data (last 12 months)			
Target	*Purchaser*	*Price paid*	*Revenue*	*EBIT*	*Earnings*	*CF to all investors*
Biros Inc.	Kinerion Inc.	\$75,650	\$58,190	\$9,460	\$3,960	\$7,200
Viage Ent.	Bantic Networks	\$32,500	\$32,500	\$5,000	\$2,560	\$4,710
Mecent Labs	Mercuron Co.	\$145,950	\$153,630	\$12,160	\$5,770	\$17,388
Protoscan Inc.	Neurovage, L.V.	\$88,275	\$73,560	\$9,100	\$4,700	\$14,240

NOTE: *All monetary values in \$thousand.*

Using the relative value method

- Calculate M&A price to cash flow multiples

Recent M&A transactions

Target	*Purchaser*	*Price paid*	*CF to all investors*	*Price / CF to all investors*
Biros Inc.	Kinerion Inc.	$75,650	$7,200	10.5
Viage Ent.	Bantic Networks	$32,500	$4,710	6.9
Mecent Labs	Mercuron Co.	$145,950	$17,388	8.4
Protoscan Inc.	Neurovage, L.V.	$88,275	$14,240	6.2
				Average = 8.0

NOTE: *All monetary values in $thousands.*

- Continuing value = CF multiple x DCI Year 5 CF_{likely} = 8.0 x $0.5 million = $4 million

Using the venture capital method

Step 1. Select a year for the start of the continuing value period of the valuation by determining a point where, if the venture is successful, harvesting by acquisition or IPO or other means would be feasible. Estimate net income or other cash flow in that year based on the "success" scenario.

Step 2. Use the appropriate P/E ratio or other multiple and the harvest-date earnings or cash flow projection to compute continuing value. The multiple should reflect the expected capitalization of earnings or cash flow for a company that has achieved the level of success reflected in the scenario.

Step 3. Convert the continuing value estimate to PV by discounting at a hurdle rate that you believe is high enough to compensate for time value, risk, and the probability that the "success" scenario will not be achieved.

Step 4. Based on estimated PV, it is possible to compute the minimum fraction of ownership an investor would require in exchange for contributing a given amount of capital.

Valuation at Various Discount Rates by the Venture Capital Method

Cash Flows	Total	0	1	2	3	4	5
Success Scenario		$ (3,000)	$ (1,500)	$ 1,000	$ 3,000	$ 5,000	$ 117,000
Discount Rate =	**40%**						
Present Value	**$23,588**	-$3,000	-$1,071	$510	$1,093	$1,302	$21,754
Discount Rate =	**60%**						
Present Value	**$12,106**	-$3,000	-$938	$391	$732	$763	$11,158
Implied Single Rate							
Rate	**57.84%**						
Present Value	**$12,963**	-$3,000	-$950	$401	$763	$806	$11,943

Cash flows from the discrete success scenario are valued by the Venture Capital Method, with discount rates commonly applied when the VC approach is used

Comparing the venture capital method

- Advantages of the VC method
  - valuation can be driven by a “success” scenario financial projection
  - negotiation process may be facilitated by centering the negotiations on the entrepreneur’s projections
  - investor’s experience may be easiest to apply without formal analysis when comparisons of ventures are made on the basis of “success” scenarios
  - easy to use and may be adequate for simple investment decisions

Comparing the venture capital method

- Disadvantages of the VC method
  - lack of precision due to reliance on unnecessarily limited information and rules of thumb
  - biases result from discounting optimistic cash flow projections at a hurdle rate that is above cost of capital
  - lack of information about uncertainty, which would be useful for valuing complex financial claims

Using the First Chicago method

- The First Chicago method uses discrete scenarios and probabilities
- Calculate expected cash flow based on scenarios
- Discount expected cash flows to compute PV
- Same as using the RADR approach applied to expected CFs computed from discrete scenarios
  - CAPM is the correct pricing model

Comparing the First Chicago method

- Advantages of the First Chicago method
  - discrete scenarios provide a simple method of estimating both risk and expected return
  - intent is to value expected cash flows
  - uses an estimate of the opportunity cost of capital as the discount rate
  - because information about total risk is derived, the method provides a basis for valuing complex financial claims

Comparing the First Chicago method

- Disadvantages of the First Chicago method
  - discrete scenarios discard information about risk that could be useful, especially for valuing complex claims
  - no guidance is provided about how to determine the discount rate(s) to be used in the valuation
  - no basis is provided for assigning probabilities to the different scenarios used in the valuation

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Chapter 11

THE ENTREPRENEUR'S PERSPECTIVE ON VALUE

Valuation: The Entrepreneur's Perspective

1. Underdiversification causes the entrepreneur's required rates of return to be higher than that of a diversified investor
2. Ownership claims of investors and entrepreneurs are not identical
3. The parties may have different beliefs about expected performance and risk

Opportunity Cost and Choosing Entrepreneurship

What drives the decision to become an entrepreneur?

- Opportunity cost of committed
  - human capital

    and
  - financial capital

The Entrepreneur as an Underdiversified Investor

- Cost of capital depends on the ability to diversify
  - diversified investors determine the risk-return trade-off for market assets
  - voluntary underdiversification does not justify a higher discount rate
- What makes entrepreneurial investment different?
  - new ventures are not market assets
  - entrepreneurs must bear nonmarket risk
- Deciding whether the return is worth the extra risk
  - adjust the required rate of return in light of the risk the entrepreneur bears

Attributes of Entrepreneurs: Data on Wealth, Savings, and Diversification

- Wealth
  - less diversified at higher levels of wealth and income
  - inheritance increases the probability of becoming (and remaining) an entrepreneur
- Savings/investment: Business owners
  - have higher savings rates
  - have higher wealth-to-income and savings-to-income ratios
- Diversification: Business owners
  - are less diversified; hold more wealth in business assets and non-residential real estate
  - become less-diversified over time

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

Entrepreneur with total wealth of \$300,000 is considering a \$100,000 investment in a venture with the following likely payoffs:

Scenario	Probability	Year 1 payoff	Return
Success	1/3	\$200,000	100%
Likely	1/3	\$125,000	25%
Failure	1/3	\$53,000	−47%

Expected return = $[(100\% \times 1/3) + (25\% \times 1/3) + (-47\% \times 1/3)] = 26\%$

Standard deviation of expected return:

$= [(100\% - 26\%)^2 \times 1/3 + (25\% - 26\%)^2 \times 1/3 + (-47\% - 26\%)^2 \times 1/3]^{0.5} = 60\%$

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- Other assumptions
  - risk-free rate = 4.0%
  - Expected market return = 12%
  - standard deviation of market return = 15%
  - correlation between the venture's return and the market = 0.5
- We can now estimate the venture's beta

$$\beta_j = \frac{\rho_{r_j, r_M} \sigma_j}{\sigma_M} = \frac{0.5 \times 0.60}{0.15} = 2.0$$

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- The CAPM return a well-diversified investor would require to invest in the venture:

$$r_j = r_F + \beta_j(r_M - r_F) = 4\% + 2.0(12\% - 4\%) = 20\%$$

- With 1/3 of total wealth committed to the venture, the entrepreneur faces more risk than a well-diversified investor.

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- What if the entrepreneur were to achieve the same risk by leveraging the market portfolio?
- Assuming the entrepreneur's portfolio consists of two assets, the project and the market, it has the following standard deviation:

$$\sigma_{\text{port}} = \sqrt{x_M^2\sigma_M^2 + x_P^2\sigma_P^2 + 2x_M x_P \rho_{M,P}\sigma_M\sigma_P}$$

Where $\rho_{M,P}$ is the correlation between the market and the project, and x_p and x_m are the weights invested in the project and the market respectively.

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- With x_p = 1/3, x_m = 2/3, and the other assumptions shown, the portfolio standard deviation is

$$\sigma_{\text{port}} = \sqrt{(2/3)^2 0.15^2 + (1/3)^2 0.60^2 + 2(2/3)(1/3)(0.5)(0.15)(0.60)}$$
$$= 0.265 \quad \text{or} \quad 26.5\%$$

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- The following formula allows us to calculate a portfolio's required return, using the total risk of the portfolio as compared to the market:

$$r_{Port} = r_F + (\sigma_{Port}/\sigma_M)RP_M$$

- Using the CAPM approach, the entrepreneur's required return on her risky portfolio is

$$\begin{aligned} r_{Port} &= r_F + (\sigma_{Port}/\sigma_M)(r_M - r_F) \\ &= 4\% + (26.5\%/15\%)(12\% - 4\%) \\ &= 18.1\% \end{aligned}$$

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- The required return on the risky portfolio is a weighted average of the required return on the project and the required return on the market

$$r_{\text{port}} = x_P r_P + x_M r_M$$

- Which we can rearrange to solve for r_p, the project required return:

$$r_P = \frac{r_{\text{port}} - x_M r_M}{x_{\text{port}}} = \frac{18.1\% - (2/3)(12\%)}{(1/3)} = 30.3\%$$

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- The entrepreneur's opportunity cost of investing one-third of her wealth in the new venture is 30.3%
- This is 50% higher than the diversified investor's 20% required return and also higher than the expected return of 26%

⇒ if the entrepreneur invests one-third of her wealth in the venture, her expected NPV is negative

The Entrepreneur as an Underdiversified Investor: A Simple Illustration

- Summary
  - by controlling the fraction of wealth invested in the venture, the entrepreneur has some control over the cost of capital
  - if the entrepreneur is the sole investor, the choice of venture scale effectively determines the required return

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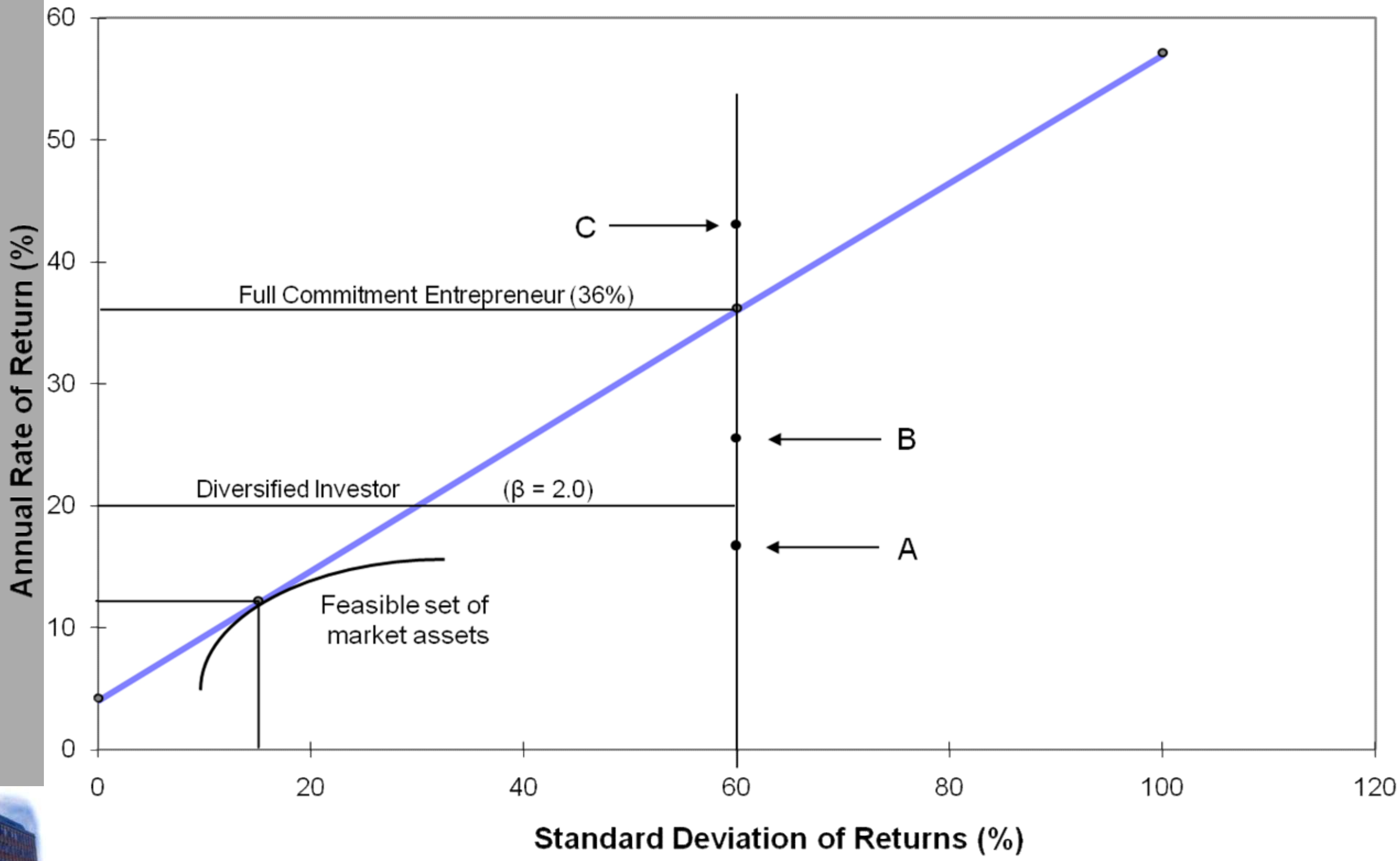
Capital Market Line (CML) - Required Rates of Return



Comparisons of estimated project values for entrepreneurs making full commitments and for well-diversified investors

Beta = 2.0, σ=60%	**Project A**	**Project B**	**Project C**
Project Returns			
Annualized rate of return	16%	24%	42%
Terminal value (year 5)	$2,100,342	$2,931,625	$5,773,534
Entrepreneur Making a Full Commitment (required rate = 36%)			
Present value	$451,435	$630,106	$1,240,930
Net present value	($548,565)	($369,894)	$240,930
Well-Diversified Investor (required rate = 20%)			
Present value	$844,080	$1,178,154	$2,320,254
Net present value	($155,920)	$178,154	$1,320,254

The Entrepreneur’s Commitment to a Venture

- A two-part commitment:
  - the financial capital commitment
  - the PV of the entrepreneur’s human capital in its highest-valued alternative use

The Entrepreneur's Commitment to a Venture

- Three issues are of concern:
  1. How can we estimate the value of the entrepreneur's human capital?
  2. How can we estimate the value of the human capital that the entrepreneur commits to the venture?
  3. What should we assume about the risk and return to human capital that is not invested in the venture?

The Entrepreneur's Commitment to a Venture

- Commitment to a venture is defined in terms of the fraction of total wealth (human and financial capital) committed
  - full commitment would mean that the entrepreneur devotes all financial and human capital to the venture
  - in practice, no entrepreneur can make a full commitment
- Estimating realistic partial commitments

The Entrepreneur's Commitment to a Venture

<u>Scenario 1</u>

- A 45 year-old entrepreneur has current salary of \$150,000 and a net worth of \$2.0 million, including \$800,000 of liquid assets and \$1.2 million in retirement savings
- Plans to retire at age 60 and is considering committing \$400,000 and 5 years to a new venture
- Will receive a salary of \$100,000 salary from the venture

Total wealth = financial wealth + human capital
= \$2.0 million + \$1.329 million
= \$3.329 million

The Entrepreneur's Commitment to a Venture

<u>Scenario 1 (cont'd.)</u>

If he pursues the venture and it fails, he can return to his current salary of \$150,000, but the growth rate will only be 4% annually for the remaining 10 years of his career.

The PV of his human capital if the venture fails is

$$PV_{\text{comp}} = \frac{\$100{,}000}{0.12 - 0.0}\left(1 - \frac{(1+0.0)^5}{(1+0.12)^5}\right) + \frac{\left[\dfrac{\$150{,}000}{0.12-0.04}\left(1 - \dfrac{(1+0.04)^{10}}{(1+0.12)^5}\right)\right]}{(1+0.12)^5}$$
$$= \$917{,}337$$

where the first term represents the 5-year venture salary, and the second is the \$150,000 salary starting in the sixth year and growing 4% annually for 10 years.

The Entrepreneur's Commitment to a Venture

Scenario 1 (cont'd.)

The difference between the PV of his human capital if he stays at his current job versus committing five years to the venture is

$$\$1,318,973 - \$917,337 = \$411,636$$

This represents the human capital commitment to the venture. Adding this to the $400,000 financial commitment yields a total commitment of

$$\$411,636 + \$400,000 = \$811,636$$

Which, based on $3.3 million of total wealth, means the entrepreneur is committing 24% of total wealth to the venture.

The Entrepreneur's Commitment to a Venture

Scenario 2

21 year-old college graduate has a job offer (starting salary of \$50,000, which is expected to grow 5% annually for 40 years) and no other financial wealth.

The student is considering committing 5 years to a new venture that would pay \$25,000 per year.

PV of his human capital (if he takes the job):

$$PV_{\text{comp}} = \frac{\$50{,}000}{0.12 - 0.05}\left(1 - \frac{(1 + 0.05)^{40}}{(1 + 0.12)^{40}}\right) = \$660{,}245$$

The Entrepreneur's Commitment to a Venture

Scenario 2 (cont'd.)

If he pursues the venture and it fails, he can start his corporate career in the 6^{th} year at a \$50,000 salary which will grow 5% annually for 35 years.

The PV of his human capital if he pursues the venture and it fails

$$PV_{\text{comp}} = \frac{\$25{,}000}{0.12 - 0.0}\left(1 - \frac{(1+0.0)^5}{(1+0.12)^5}\right) + \frac{\left[\frac{\$50{,}000}{0.12 - 0.05}\left(1 - \frac{(1+0.05)^{35}}{(1+0.12)^{35}}\right)\right]}{(1+0.12)^5}$$
$$= \$453{,}082$$

where the first term represents the 5-year venture salary, and the second is the \$50,000 salary starting in the 6^{th} year and growing 5% annually for 35 years.

The Entrepreneur’s Commitment to a Venture

Scenario 2 (cont’d.)

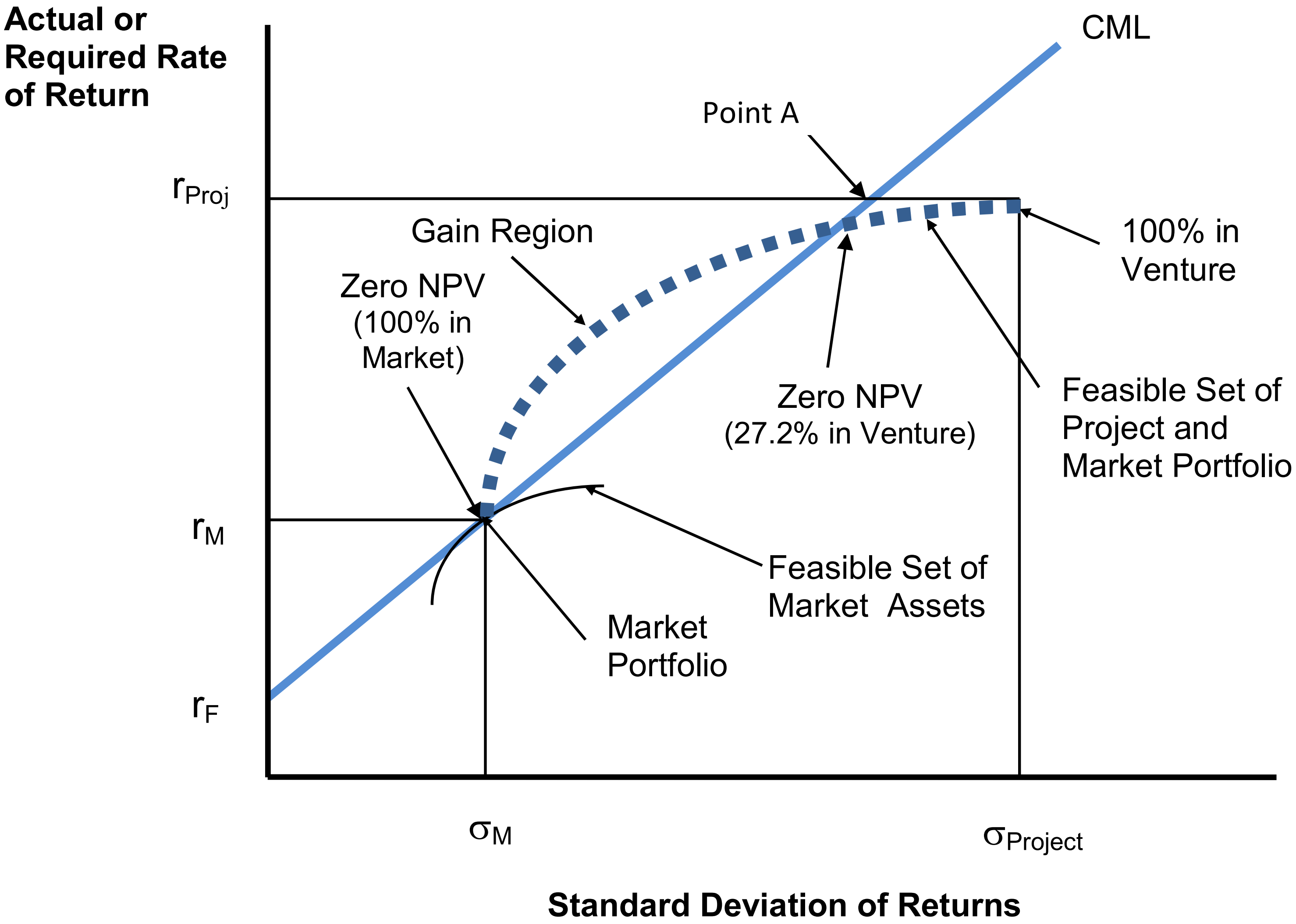
The difference between the PV of his human capital if he accepts the job offer versus committing 5 years to the new venture is

$660,245 - $453,082 = $207,163

This represents the entrepreneur’s human capital commitment to the new venture. Since he has no financial wealth, his commitment to the new venture represents 31% of his total capital:

$207,163/$660,245 = 0.31 or 31%

Why Diversification Adds Value



A Sanity Check—The Art And Science Of Investment Decisions

- Assessing sensitivity to assumptions
- Using and misusing simulation
- Treatment of sunk costs in the valuation

The Entrepreneur's Perspective on Value - Summary

- Because the entrepreneur is not well-diversified, non-market risk affects value. Entrepreneurs have higher required returns than diversified investors and cannot rely on the valuations of diversified investors
- The main factor that can bring the entrepreneur's value closer to that of the outside investor is when the entrepreneur does not have to commit a very large fraction of total wealth to the venture
- Investments that are recoverable reduce the size of the entrepreneur's commitment and increase venture acceptability, as does shortening the length of the commitment
- Because the entrepreneur cares about total risk but the investor cares only about market risk, the disparity between their valuations is greater the higher the total risk of the venture compared with its market risk