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“Theoretical Models for FinTech Valuation”

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# Theoretical models for fintech valuation

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25 November 2016

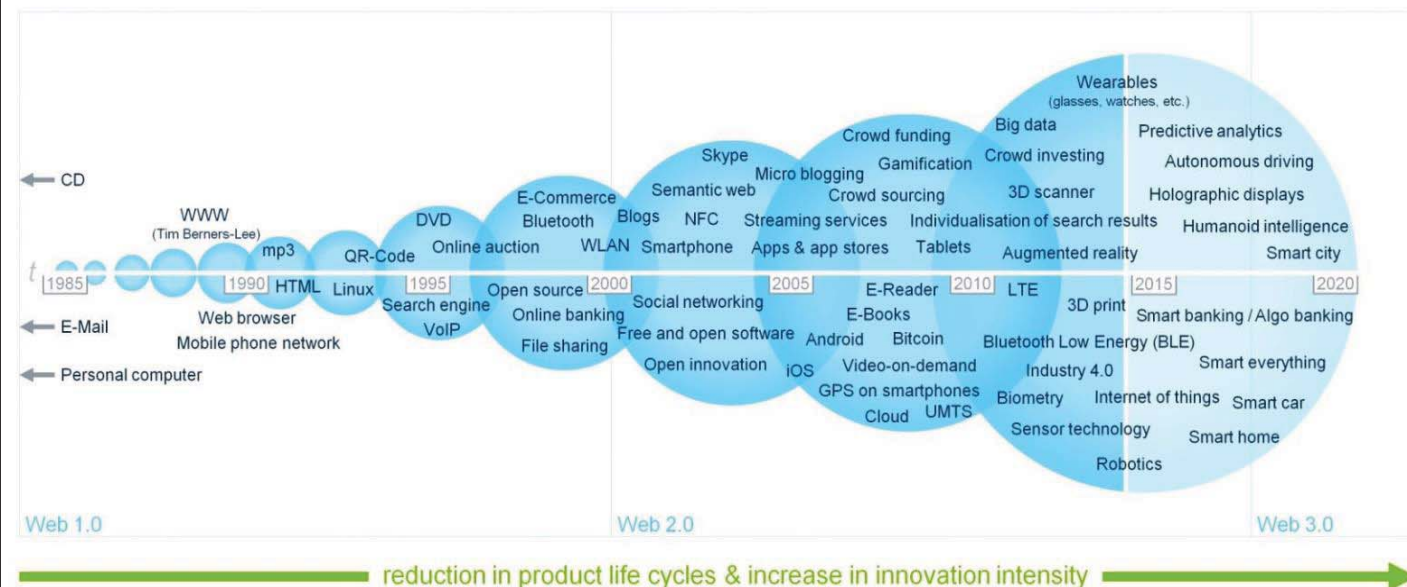
## Content

- Intro. to Fintech startups
- An overview of fintech valuation models
- Factors that determine future Fintech valuation
- Valuation models for Fintech & related model modifications
- Limitations & Future research
- Conclusion

# Fintech – The digital (r)evolution in the financial sector

Milestones in the internet age

6



Graph: Oliver Ullmann. Deutsche Bank Research.

Source: Dapp, T. (2014). Fintech – The digital (r)evolution in the financial sector: Algorithm-based banking with the human touch. Deutsche Bank Research. Frankfurt am Main.

## Digitization is coming..

"banking will always be needed but banks as we know them could easily disappear." -

@BillGates #fintech #banking

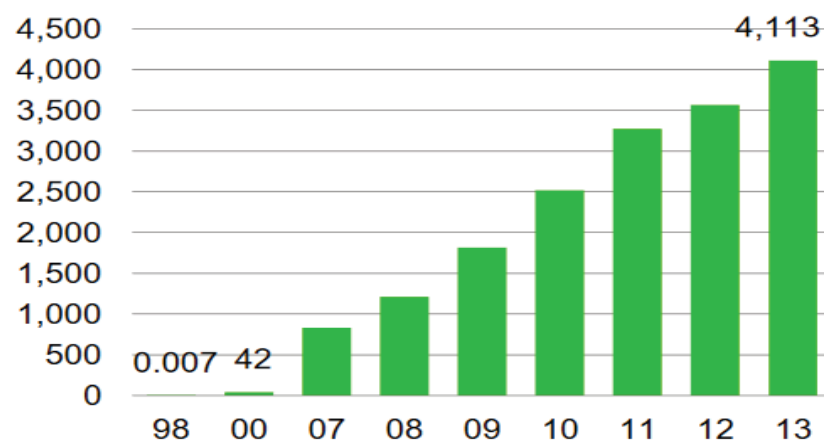
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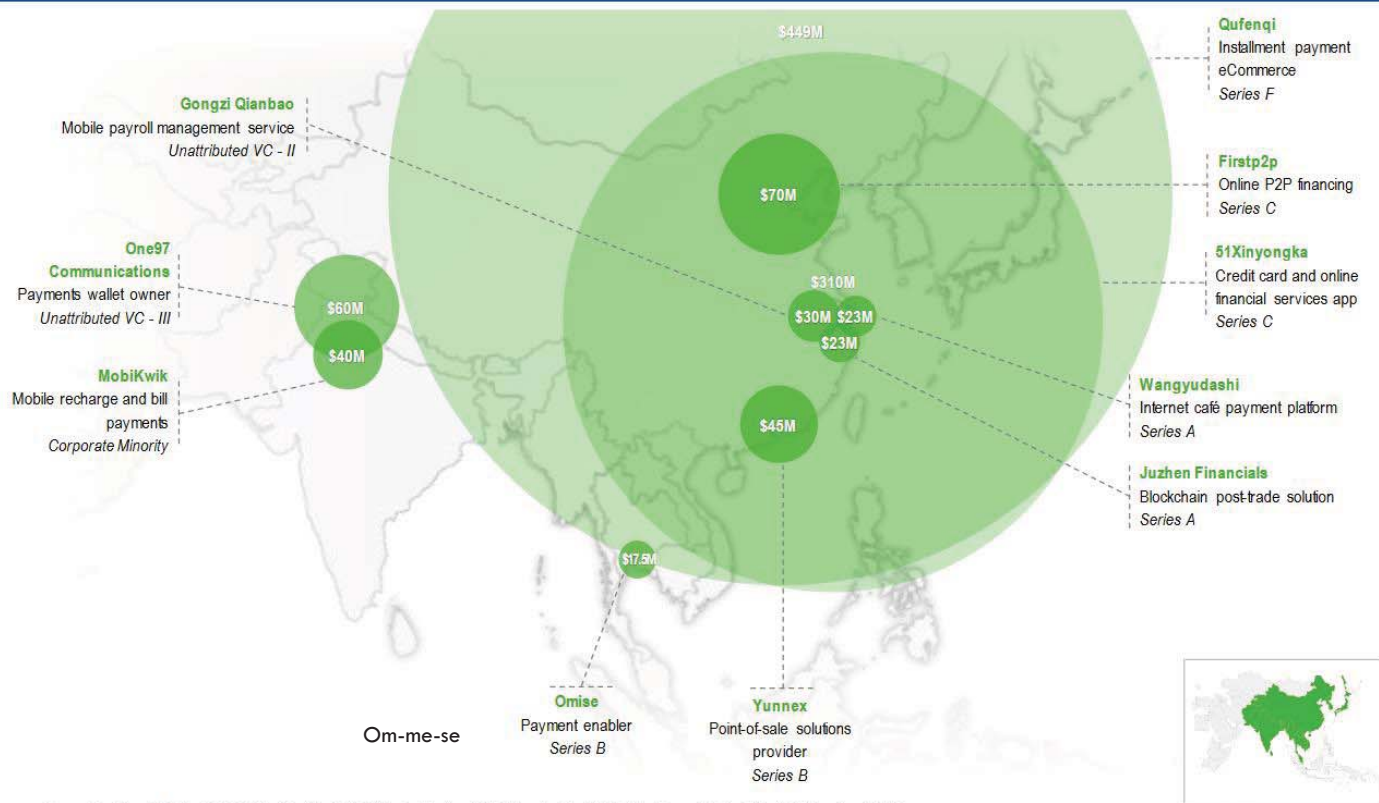
## Technologies meets Financial = Fintech

- Fintech companies, which are *mostly startups*, have increased dramatically in number –from about 1,000 in 2005 to over 8,000 in 2016
- *Globally*, fintech funding is increasing at an accelerating rate: the US\$5.5 billion in total funding of 11 years ago has skyrocketed to a cumulative \$78.6 billion in 2015, according to the Boston Consulting Group's fintech database

## Fintech – The (r)evolution of financial sector

- Non-cash payment transactions, which today constitute 22% of all consumer payments, will overtake cash payment in 2023 , according to BCG projection.
- Biggest firms in the financial sector invested \$30 million in Chain Inc., a company that works with banks and other institutions to develop blockchain (distributed ledger system). This include Visa Inc., Nasdaq Inc., Citi , Capital One Financial Corp.
- And its coming right to your door steps.. (see next slide)

# \$1.07B DEPLOYED TO TOP 10 ASIAN FINTECH DEALS OF Q3'16



Source: The Pulse of Fintech, Q3 2016, Global Analysis of Fintech Venture Funding, KPMG International and CB Insights (data provided by CB Insights) November 16, 2016.

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#FINTECH

KPMG



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## The (current) nature of Fintechs

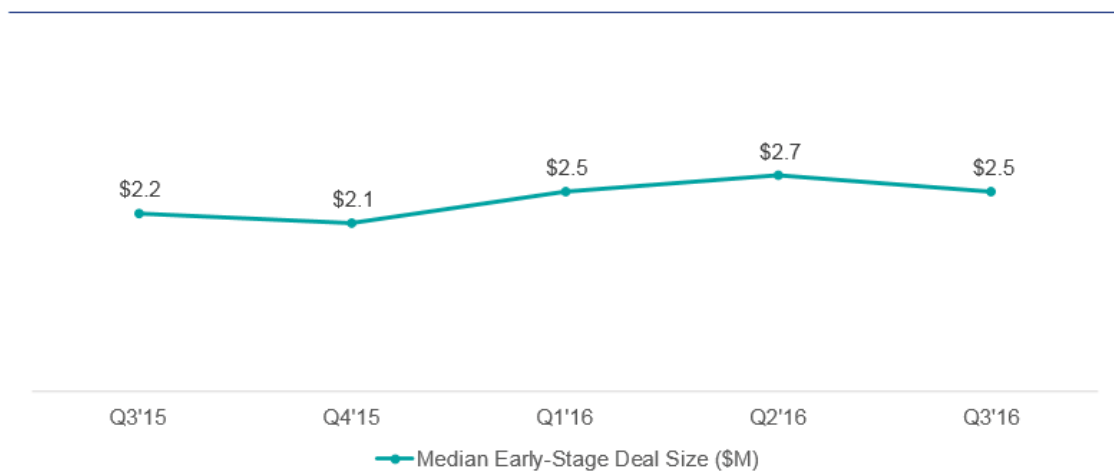
- Typically, they are startups.
- In need of capital to fund future investment
- Very high growth potential and very high risks.
- Usually require Business Angels and/or Venture Capitalists
- The trend of high growth fintech VC is unlikely to hold in the long run. (see recent KPMG Fintech quarterly reports)

## Fintechs (currently) are small startups that rapidly growing

Median early-stage (Seed — Series A) deal size among all VC-backed fintech companies was \$2.5M in Q3'16. Despite falling below Q2'16 highs, median early-stage fintech deal size was 14% higher than the same quarter last year.

### Global Early-Stage Fintech Deal Size

Q3'15 – Q3'16



Source: The Pulse of Fintech, Q3 2016, Global Analysis of Fintech Venture Funding, KPMG International and CB Insights (data provided by CB Insights) November 16th, 2016.

## Overview of the startups valuation models

- DCF methods
  - APV method
  - Real option method
  - rNPV method
  - Many other DCF-based models
- Multiple methods
  - Previously acquired/previously IPO as benchmark
- Comprehensive Methods :
  - First Chicago method
  - Venture Capital method

## Factors that determine Fintech valuation

- The intrinsic valuation of a Fintech, is usually a problem of BAs, VCs and founders. It is a central matter to both investors and founders (see Cumming and Dai, 2011; Hsu, 2007; Engel and Keilbach, 2007; Hochberg 2010; Gompers 2010 among others).
- However, the real figure that BA/VC use to negotiate the price for fintech shares is also depends on other quality factors.
- Recent academic researches has indentified some of these.

### Factors that determine Fintech valuation: The Entrepreneurs characteristics

- Generally, both BAs and VCs agree that the entrepreneur itself and the management team are the two factors that mostly influence their involvement in a financing deal.
- There exist a number of literatures that support the above posits (see MacMillan, Zemann and Subbanarasimha., 1987; Van Osnabrugge and Robinson, 2000; Van Osnabrugge, 2000)
- In a recent literature, Sudek (2006) document that the trustworthiness of the entrepreneur, quality of the management team, enthusiasm of the lead entrepreneur, and exit opportunities for the business angel are the BAs' top criteria.

## The Entrepreneurs characteristics ...

Gompers, Kovner, Lerner, and Scharfstein. (2010) , *JFE*

- A venture-capital-backed entrepreneur who succeeds in a venture (by Gomper's definition, starts a company that goes public) has a 30% chance of succeeding in his next venture.
- In contrast, first-time entrepreneurs have only an 18% chance of succeeding and entrepreneurs who previously failed have a 20% chance of succeeding.
- Hence, according to Gompers et al., the *perception* of performance persistence – *the belief* that successful entrepreneurs are more skilled than unsuccessful ones – *can induce real performance persistence*

## The Entrepreneurs characteristics ...

- Columbo and Grilli (2005) : Firms founded by individuals with selected human capital characteristics (i.e. greater university-level education in management and economics and greater prior work experience in technical functions in the sector in which the new firm operates) can grow larger than other firms.
- Hsu (2007) finds that various characteristics of founders are important determinants in VC evaluations: prior experience in founding, both human capital (e.g., training and prior professional experience) and social capital (e.g., social skills and charisma) of the start-up's founders are all positively correlated with higher evaluations
- In summary, founders' human capital has a direct positive effect on firm growth

## Factors that determine Fintech valuation: Information Asymmetries

- Information asymmetry becomes critical when investors try to evaluate companies based on the subset of information they are provided by the founders or able to collect (Binks, Ennew, and Reed, 1992).
- Zheng, Liu, and George (2010) document two kinds of information that influence investor evaluations: internally generated information on the start-up's *innovative capability* and externally verifiable information on the *start-up's inter-company network attributes*. The study is based on the idea that company capabilities are heterogeneous among the market participants and hence lead to different company performance (Teece Pisano, and Shuen, 1997; Cockburn, Henderson, and Stern, 2000).

## Factors that determine Fintech valuation : Investors characteristics

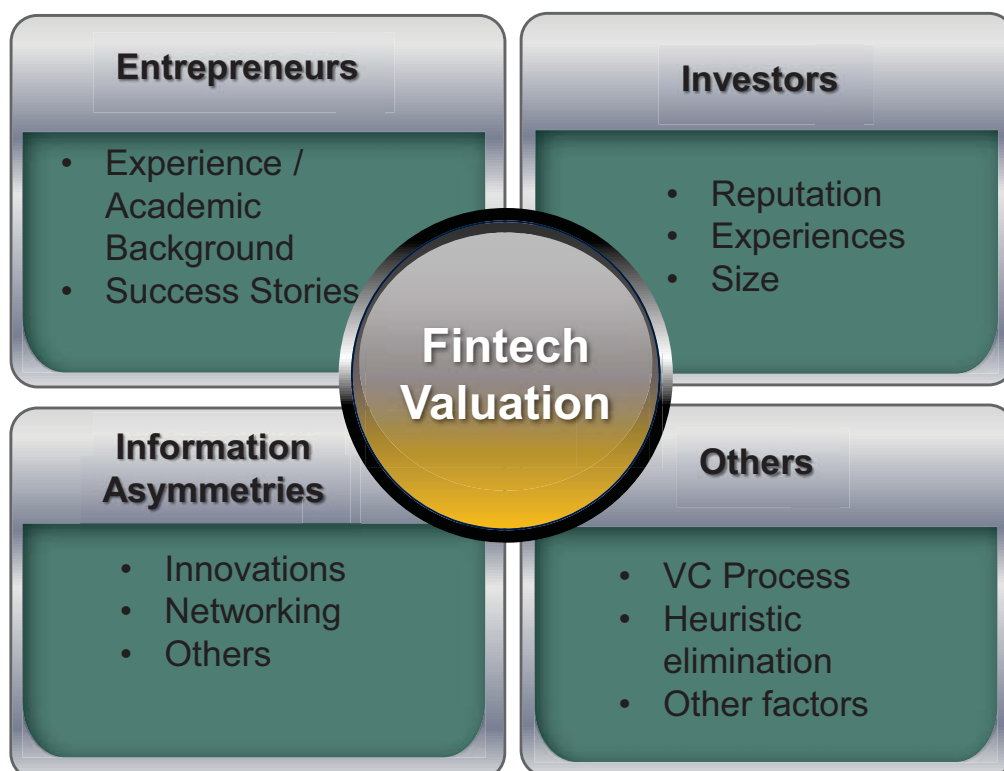
- Start-up evaluations might not depend on startup characteristics only, but also on those of the investors.
- Cumming and Dai (2011) present empirical evidence on how VCs' *reputation, size, and limited attention* impact their bargaining power and consequently valuations in addition to venture quality and market conditions.
- Hochberg, Ljungqvist, and Lu (2010), *JF*, document that VC networking is a determinant of VC bargaining power. This translates into cheaper shares for VCs.
- Sorensen (2007), companies funded by more experienced VCs are more likely to go public.

## Factors that determine Fintech valuation :

The VC process, does it matters?

- Some of the factors are more important than others..  
(VC selection by elimination)
- Maxwell Jeffrey, and Levesque (2011) provide a list of specific criteria based on prior research that is also suited as an “elimination-by-aspects heuristic” which investors can follow to easily reject the majority of opportunities: adoption, product status, protectability, customer engagement, route to market, market potential, relevant experience and financial model

## Academic Framework to determine Fintech valuation



## How do all these (factors) matters?

- A good fintech valuation model should incorporate all (or most) of the aforementioned factors in to consideration.
- However, to put a long list of factors on the table is not a good approach to develop a practical valuation model. Maxwell et al. (2011) argue that opposed to this list of characteristics, behavioural decision research has clearly shown how investors in practice often tend to use cognitive shortcuts known as heuristics, which lead to the use of a smaller number of criteria to evaluate the company only in the case when they present values above or below a determined threshold.

## How do all these (factors) matters?

- Since investors tend to use fewer factors (and indentifying all the factors would be simply impossible).

A good practical approach, is therefore, to use a proxy (or a few proxies) of risk to account for these factors.

- In this context, Festel, Wuermseher, Cattaneo (2013), proposed an approach to adjust the risk factors in CAPM model to correct for the high risk associate with fintech startups.

## Valuation methods for startups

- Many have identified the DCF method as the most dominant in practice (Jennergren, 2008; Jiménez and Pascual, 2008).
- According to Vinturella and Erickson (2004) and Fernandez (2007) it is also the most conceptually correct.
- Famous among VC are First Chicago method and VC method. Both required an estimate of discount rate

### The First Chicago Method

- The First Chicago Method is a context specific business valuation approach used by venture capital and private equity investors that combines elements of both a multiples-based valuation and a discounted cash flow (DCF) valuation approach.
- The First Chicago Method was first developed by, and consequently named for, First Chicago Corporation Venture Capital

## The First Chicago Method

Suppose your project would enter one in three scenarios in the future (high growth, low growth, fail to success).The valuation proceeds as follows.

1. For each of the three cases, a scenario specific, *internally consistent* forecast of cashflows is constructed for the years leading up to the assumed divestment by the private equity investor.
2. A divestment price - i.e. Terminal value - is modelled by assuming an *exit multiple* consistent with the scenario in question. (Of course, the divestment may take various forms)

## The First Chicago Method

3. The cash flows and exit price are *then discounted* using the *investor's required return*, and the sum of these is the value of the business under the scenario in question.

4. each of the three scenario-values are multiplied through by a probability corresponding to each scenario (as estimated by the investor). The value of the investment is then the probability weighted sum of the three scenarios.

## The Venture Capital Method

The Venture Capital Method (VC Method) was first described by Professor Bill Sahlman at Harvard Business School in 1987. The concept is simply...since:

Return on Investment (ROI) = Terminal (or Harvest) Value  $\div$  Post-money Valuation

(in the case of one investment round, no subsequent investment and therefore no dilution) :Therefore:

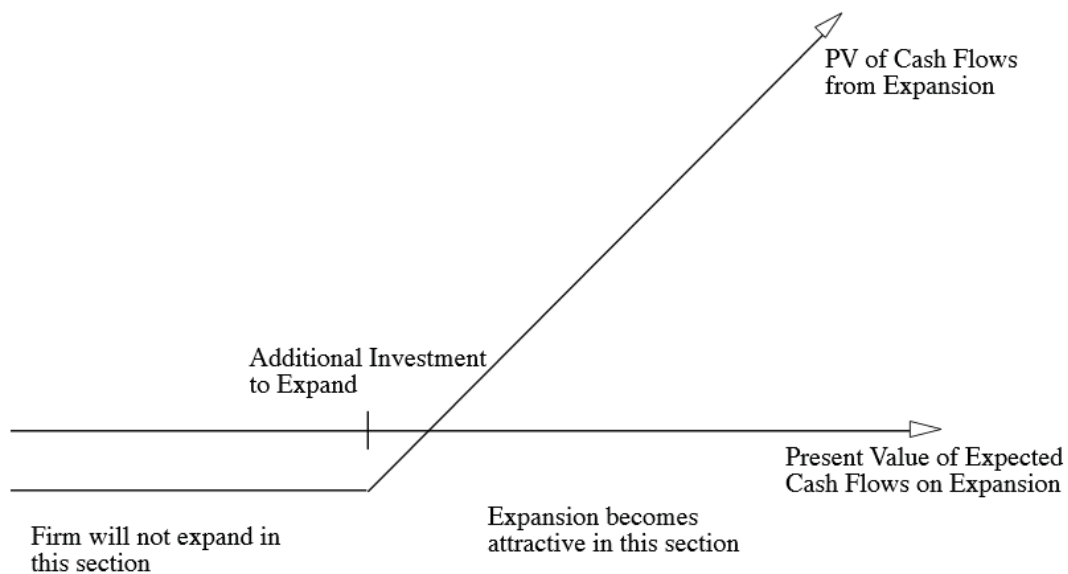
Post-money Valuation = Terminal Value  $\div$  Anticipated ROI

## The real option method

- Fintech startups often offer many rounds of investment (round A, round B, round C ...)
- As with all startups, the amounts of expected cash inflows sometimes related to the option to expand the firm. These are actually a form of real option. We could use option valuation models to estimate firms value.
- Also, sometimes other VCs/BAs offer a known “abandon value”. We could utilize option to abandon to value the firm.

## The real option method

### The Option to Expand

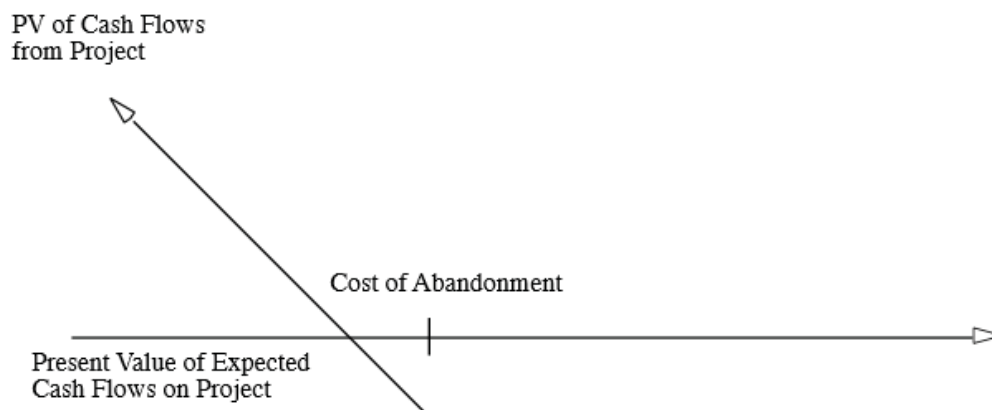


## The real option method

### The Option to Abandon

A firm may sometimes have the option to abandon a project, if the cash flows do not measure up to expectations.

If abandoning the project allows the firm to save itself from further losses, this option can make a project more valuable.



## Fintech discount rate

- Most fintech valuation models require an estimate of an appropriate discount rate
- It is important to note that usually high tech start-ups are completely financed through equity, which means that the cost of capital equals the cost of equity.
- A well known model for this is CAPM. It is widely utilized to estimate the required return on equity.

## Cost of equity estimation using CAPM

In the CAPM, individual systematic risk related to a company is expressed through a so-called beta coefficient, a measure of risk relative to a peer group (Vinturella and Erickson, 2004). The beta coefficient has a significant impact on the capital costs, as the CAPM equation shows (Fernández, 2004b; Ai and Brockett, 2008; Womack and Zhang, 2003):

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$

where:  $E(R_i)$  is the expected return on the capital for asset  $i$ ,  $R_f$  is the risk-free interest rate that is usually derived from the yield of high-quality government bonds,  $E(R_m)$  is the expected return of the market,  $[E(R_m) - R_f]$  is the expected market risk premium, and  $\beta_i$  is the sensitivity of the expected excess returns from asset  $i$  to the expected excess market returns, or also

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\sigma^2(R_m)}$$

with  $\text{Cov}(R_i, R_m)$  as the covariance between the return of the market and the return of the asset  $i$ , and  $\sigma^2(R_m)$  as the variance of the return of the market.

## Cost of equity estimation using CAPM

- In the CAPM, individual systematic risk related to a company is expressed through a so-called *beta* coefficient, a measure of risk relative to a peer group.
- The beta coefficient is of central importance as an expression of the investor perceived or expected risks.
- A beta could be derived from either financial history or a sensibility analysis based on the forecasted cash flows (for example, a regression between stock returns and market returns)

## Fintech beta estimation

- However, start-ups usually lack financial history and the estimation of variability in future earnings
- These might become problematic, making traditional CAPM not suitable to value fintechs
- The beta coefficient for early stage start-ups cannot be derived from past values or by comparison with companies of a peer group.

## Fintech beta estimation

- According to Achleitner and Nathusius, (2004) The rate of return expected by investors in early stage investments is 39.5%. This translate into a very high average beta estimate of 6.4
- According to Festela, Wuermseherb, Cattaneoc (2013), the determination of a premium or a discount to the beta coefficient depending on the risk profile, associated with the startup, based on information from the business plan and additional discussions with the founders or the management team. It contains all the relevant categories such as technology, products, implementation, organisation and financial aspects

Results of the evaluation of the selected start-ups\*

| Nr. | Sector    | Country     | Initial<br>company<br>value<br>[mn Euro] | Adjustment<br>of the beta<br>coefficient | Adjusted<br>beta<br>coefficient | Adjusted<br>discount rate | Adjusted<br>company<br>value<br>[mn Euro] |
|-----|-----------|-------------|------------------------------------------|------------------------------------------|---------------------------------|---------------------------|-------------------------------------------|
| 1   | Biotech   | Switzerland | 1.3                                      | 3.0                                      | 9.6                             | 0.55                      | 0.6                                       |
| 2   | Biotech   | Germany     | 1.3                                      | 7.5                                      | 14.1                            | 0.79                      | 0.2                                       |
| 3   | Biotech   | Germany     | 1.8                                      | -3.5                                     | 3.1                             | 0.21                      | 7.6                                       |
| 4   | Cleantech | Switzerland | 2.1                                      | -1.0                                     | 5.6                             | 0.34                      | 3.2                                       |
| 5   | Cleantech | Germany     | 2.3                                      | -2.5                                     | 4.1                             | 0.26                      | 5.9                                       |
| 6   | Nanotech  | Germany     | 2.4                                      | 3.0                                      | 9.6                             | 0.55                      | 1.0                                       |
| 7   | Biotech   | Germany     | 2.5                                      | 4.5                                      | 11.1                            | 0.63                      | 0.7                                       |
| 8   | Biotech   | Germany     | 2.5                                      | -0.5                                     | 6.1                             | 0.36                      | 2.9                                       |
| 9   | Medtech   | Germany     | 2.6                                      | 5.5                                      | 12.1                            | 0.68                      | 0.6                                       |
| 10  | Cleantech | Germany     | 2.9                                      | -4.0                                     | 2.6                             | 0.18                      | 16.5                                      |
| 11  | Cleantech | Germany     | 3.1                                      | 3.5                                      | 10.1                            | 0.58                      | 1.0                                       |
| 12  | Nanotech  | Germany     | 3.2                                      | 3.0                                      | 9.6                             | 0.55                      | 1.4                                       |
| 13  | Cleantech | Germany     | 3.2                                      | 2.5                                      | 9.1                             | 0.52                      | 1.5                                       |
| 14  | Biotech   | Germany     | 3.3                                      | -0.5                                     | 6.1                             | 0.36                      | 3.7                                       |
| 15  | Biotech   | Germany     | 3.5                                      | -1.0                                     | 5.6                             | 0.34                      | 4.8                                       |
| 16  | Biotech   | Switzerland | 4.5                                      | 2.5                                      | 9.1                             | 0.52                      | 2.0                                       |

\* The initial company value is always calculated with the basic beta coefficient 6.6.

### Assessment scheme of one of the start-ups to adjust the basic beta coefficient

| Category   | Subcategory                                     | Adjustment of the beta coefficient             |                                                            |                                                 |                                                       |                                                          | Result      |
|------------|-------------------------------------------------|------------------------------------------------|------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------|-------------|
|            |                                                 | +1                                             | +0,5                                                       | 0                                               | -0.5                                                  | -1                                                       |             |
| Technology | Maturity of technology                          | Technology still in initial experimental phase | <b>Technology successful on a laboratory scale</b>         | Technology successful in pilot plant            | Technology successful in demo plant                   | Technology successful in technical application           | <b>0.5</b>  |
|            | Advantages compared to competitive technologies | No advantages identified                       | Advantages not clearly identifiable                        | Costs or quality advantages identifiable        | <b>Costs and quality advantages identifiable</b>      | Significant costs and quality advantages identifiable    | <b>-0.5</b> |
|            | Reputation of scientist                         | <b>No reputation</b>                           | Poor reputation                                            | Moderate reputation                             | Good reputation                                       | Very good reputation                                     | <b>1.0</b>  |
|            | Patent protection                               | No patent application                          | <b>First patent application filed</b>                      | Basic patent close to being granted             | Basic patent granted                                  | Extensive portfolio of granted patents                   | <b>0.5</b>  |
| Products   | Product benefits                                | Product benefits not identifiable              | <b>Product benefits not clearly identifiable</b>           | Product benefits clearly identifiable           | Product benefits confirmed by first clients           | Product benefits confirmed by numerous clients           | <b>0.5</b>  |
|            | Unique selling proposition                      | Unique selling proposition not identifiable    | <b>Unique selling proposition not clearly identifiable</b> | Unique selling proposition clearly identifiable | Unique selling proposition confirmed by first clients | Unique selling proposition confirmed by numerous clients | <b>0.5</b>  |
|            | Scalability                                     | Very low scalability                           | <b>Low scalability</b>                                     | Moderate scalability                            | High scalability                                      | Very high scalability                                    | <b>0.5</b>  |
|            | Competition                                     | Currently strong competition                   | <b>Potentially strong competition</b>                      | Moderate competition                            | Low competition                                       | Long-term low competition                                | <b>0.5</b>  |

|                       |                                    |                                                              |                                                         |                                                                     |                                                          |                                                               |             |
|-----------------------|------------------------------------|--------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|-------------|
| <b>Implementation</b> | Business plan                      | <b>Business plan unjustifiable</b>                           | Business plan with open questions                       | Business plan plausible                                             | Business plan occasionally proven                        | Business plan frequently proven                               | <b>1.0</b>  |
|                       | Technical development plan         | Technical development plan unjustifiable                     | <b>Technical development plan difficult to justify</b>  | Technical development plan justifiable                              | Technical development plan likely to be feasible         | Technical development plan very likely to be feasible         | <b>0.5</b>  |
|                       | Marketing plan                     | Marketing plan unjustifiable                                 | Marketing plan difficult to justify                     | <b>Marketing plan justifiable</b>                                   | Marketing plan likely to be feasible                     | Marketing plan very likely to be feasible                     | <b>0.0</b>  |
|                       | Business development plan          | Business development plan unjustifiable                      | Business development plan difficult to justify          | <b>Business development plan justifiable</b>                        | Business development plan likely to be feasible          | Business development plan very likely to be feasible          | <b>0.0</b>  |
| <b>Organisation</b>   | Competences of the management team | Management team with major flaws                             | <b>Management team with some flaws</b>                  | Management team is complete                                         | Management team is complete and competent                | Management team is complete and very competent                | <b>0.5</b>  |
|                       | Headquarters location              | Headquarters location problematic                            | Headquarters location can be improved                   | Headquarters location is fine                                       | <b>Headquarters location has advantages</b>              | Headquarters location has many advantages                     | <b>-0.5</b> |
|                       | Competences of advisory board      | Very low level of competences of advisory board/ consultants | Low level of competences of advisory board/ consultants | <b>Moderate level of competences of advisory board/ consultants</b> | High level of competences of advisory board/ consultants | Very high level of competences of advisory board/ consultants | <b>0.0</b>  |
|                       | Process efficiency                 | Process inefficient                                          | Process not very efficient                              | <b>Process efficient</b>                                            | Process very efficient                                   | Process exceptionally efficient                               | <b>0.0</b>  |
| <b>Finances</b>       | Sales plan                         | Sales plan unjustifiable                                     | <b>Sales plan difficult to justify</b>                  | Sales plan justifiable                                              | Sales plan conservative                                  | Sales plan very conservative                                  | <b>0.5</b>  |
|                       | Costs plan                         | <b>Costs plan unjustifiable</b>                              | Costs plan difficult to justify                         | Costs plan justifiable                                              | Costs plan conservative                                  | Costs plan very conservative                                  | <b>1.0</b>  |
|                       | Profitability                      | Fundamentally low profitability                              | Risk of low profitability                               | <b>Average profitability</b>                                        | Currently high profitability                             | Fundamentally high profitability                              | <b>0.0</b>  |
|                       | Liquidity plan                     | <b>Financial resources for next year are not secured</b>     | Financial resources for next year are secured           | Financial resources for next 2 years are secured                    | Financial resources for next 3 years are secured         | Financial resources for next 4 years are secured              | <b>1.0</b>  |
|                       |                                    |                                                              |                                                         |                                                                     |                                                          |                                                               | <b>7.5</b>  |

## Limitation & Future research

- Good fintech valuation model should reflect qualitative qualities of the firm. Although the Fustel (2013)'s model provide reasonably accurate results, it is still lack theoretical justification in many aspects – this is a possible area for future research
- The adjusted beta method is applicable to any early stage start-up and facilitates a better comparison among companies. However, it is more of a empirical model rather than a theoretical one. In theory, beta should reflect only systematic risks. It is still arguable whether the average beta of 6.4 satisfy this condition.

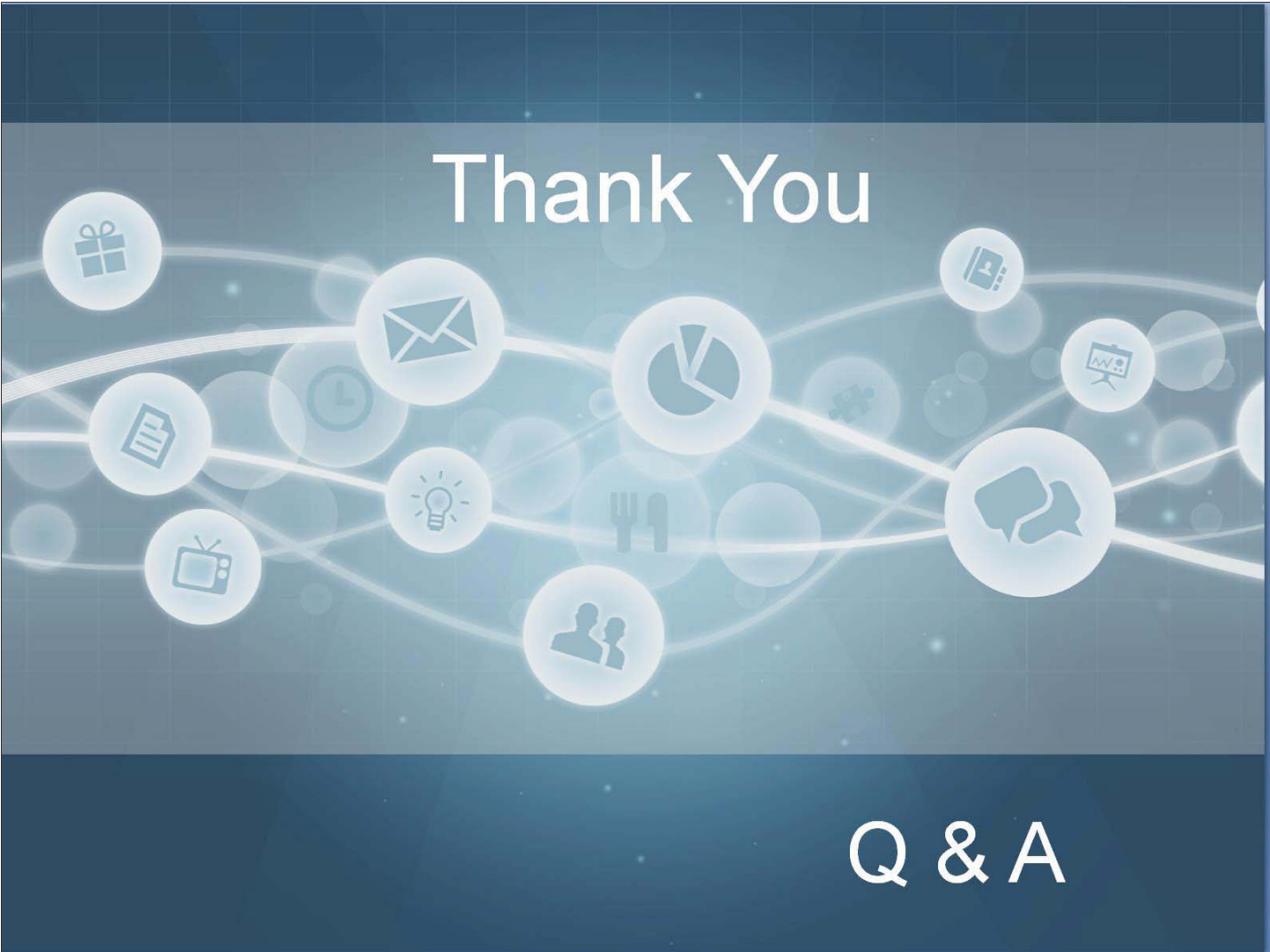
## Concluding remarks

- Most fintechs are startups. They have great potential, but difficult to value
- Existing valuation models can be modified to value fintech. In general, its better to choose models that do well in high-growth, high risks, small firm startups.
- Like other startups, the risk associate with fintechs is very high. Models that do well under high uncertainty would be ideal for fintech. (ex. Real option models)

## Concluding remarks

- Good fintech valuation models should allow for qualitative assessment of fintech. These includes, but not limited to, networking/innovative capabilities, experiences, past performance.
- Adjusted beta method is one step in a right direction as it provide a practical for existing DCF valuation methods. Although it need more theoretical justifications, it can help bringing the negotiations between entrepreneurs and investors regarding the firm value to an objective basis
- More researches are expected in the coming years

(ex. Journal of Digital Banking)

A large blue rectangular area with a grid pattern. In the center, the text "Thank You" is written in white. Surrounding the text are several circular icons connected by white lines, forming a network. The icons include a gift box, an envelope, a pie chart, a document, a lightbulb, a fork and knife, a television, a person, a speech bubble, a puzzle piece, a clock, and a person with a magnifying glass.

# Thank You

## Q & A

## Suggested readings

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