

Financial Analysis and Space Economics - an introduction

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1 Introduction

When making decisions on a supplier, a manager can access the supplier's annual report and compute some financial aspects to check its future partner financial robustness. It is important to bear in mind that Space projects last from 3 to 15 years hence you want to build a relationship in the long term with a solid partner.

Some financial ratios computation can help this decision making process.

In order to illustrate, we are using the company SAFT (batteries manufacturer) and its 2012 metrics. We are sometimes approximating some ratios as we based our calculations on various available data from the company. Several entities and branches, of which we don't distinguish the control and ownership, are here gathered under a unique SAFT denomination for simplification.

Note that we are presenting here a marginal method of financial analysis, in practice, expert build database of a particular sector (here space) and compare the company's result to this database. Here we assume that you might not always have access to such a database but would build one as you work in the industry. If you notice a ratio that is "out-of-family", then you should investigate further (ask an expert) before making a purchasing decision on that specific supplier.

All calculations here are based on SAFT 2012 annual report available on the company website in section "investors" [1]. You can also access the details of our calculations [2].

You don't necessarily need to stick to our definitions, the most important is for you to remain consistent over the companies you are monitoring in order to be able to identify outliers.

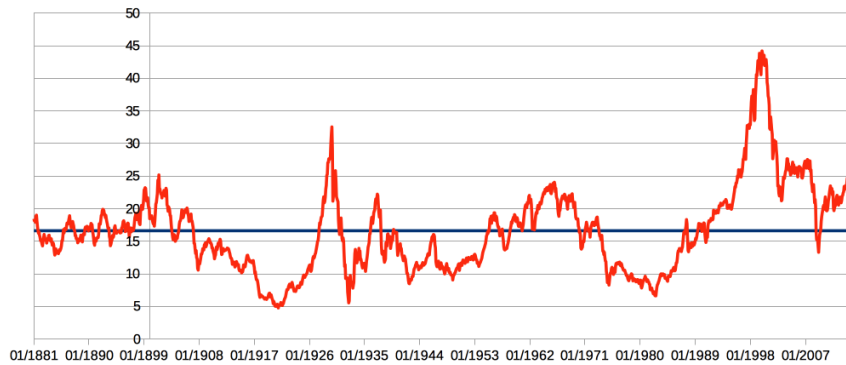
2 Some notions of financial markets

Before buying a share in a company, or investing in the stock market at all, there are some indicators an investor should consider.

2.1 Price-to-Earnings ratios

The Price-to-Earnings ratio (P/E ratio) is the **net income** over a 12-month period, divided by the weighted average **number of common shares** in issue during the period.

It is not advised to enter a market or purchase a stock if its price-earnings ratio is high compare with its historical average. In his book [3], the economist Robert Shiller uses a plot that shows how the P/E ratio for the S&P composite (an index that cover 90% of US stock capitalization) is still above its historical average. We present the Shiller P/E ratio until mid-August 2015:

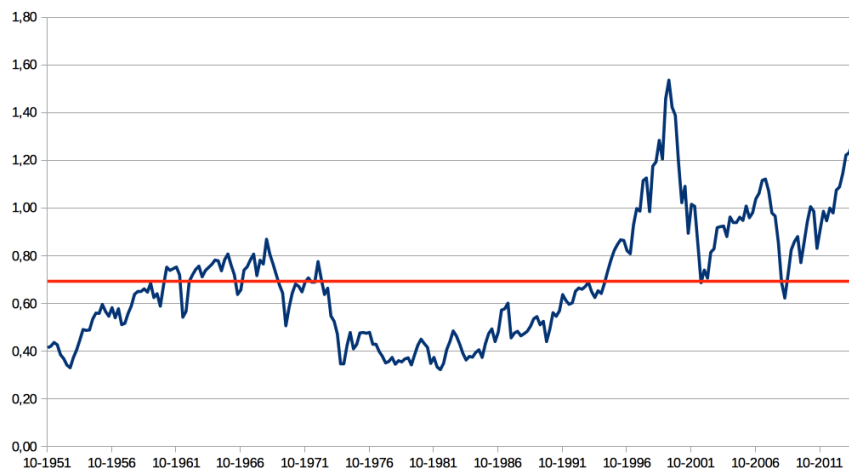


2.2 A measure of how "inflated" is the stock market

It is also relevant, before entering a geographical or industrial market to assess how "inflated" that market is. The idea is to compare the value of the companies in that region or industry versus the value of the output produced by those companies. In the case of the United-States of America:

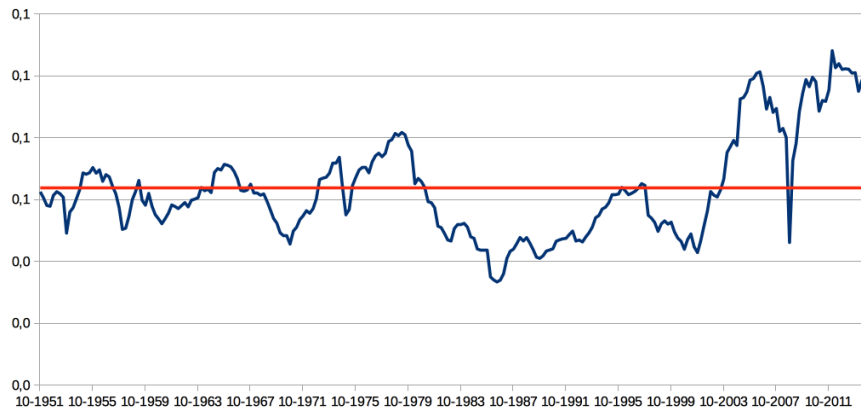
- The numerator is: US Nonfinancial Corporate Business; Corporate Equities; Liability, Level (we use the data of the Federal Reserve bank of St Louis, MVEONWMVBSNNCB)
- The denominator is: US Gross Domestic Product (we use the data of the US. Bureau of Economic Analysis, A191RC1)

This is often referred to as the Warren Buffett's indicator who has always been keen on following long term investment considerations advocated in [4].



2.3 Corporate profits

An element that is supporting a share price is the underlying company's profit. We display the ratio of the Corporate Profits After Tax in the US (as per BEA data A055RC1), divided by the US GDP:



3 Profitability

The profitability of a firm is key, it reveals whether the company is able to create value for its shareholders. Hence it is a starting point to forecast whether it will be attracting investors in the future. The Space sector requires heavy investments. For example, the budget to develop and validate a new equipment is no less than 3 million €.

3.1 ROCE

Return on capital employed (ROCE), is a measure of necessary capital investment for the activities of the firm.

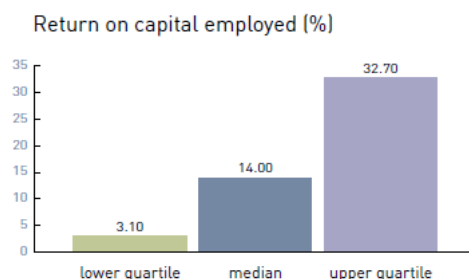
$$\text{ROCE} = \frac{\text{operating profit} \times (1 - \text{corporate income tax rate})}{\text{capital employed}}$$

Operating profit is also called Earning Before Interest and Tax (EBIT).

Capital employed = fixed assets¹ + working capital

SAFT	2012	2011	2010
ROCE	16%	20%	25%

Order of magnitude for the *manufacturing* sector in the UK [10]:



¹Fixed assets are a category of non-current assets, also known as "Property, plant and equipment"

3.2 ROE

Return on Equity is an important ratio in Private Equity practices.

$$ROE = \frac{\text{net income}}{\text{shareholders' equity}}$$

ROE is so important in the financial sector, that some academic research claim that [5]: "Return on Equity (RoE) is a central measure of performance in the banking industry[...] the pre-crisis RoE [for banks] has a strong impact on the destruction of value for shareholders for a sample of large banks in 28 countries. [...] We document a sensitivity of bank CEO compensation to RoE. **Our results [Moussu & Petit-Romec] strongly suggest that the reliance on RoE as a performance measure is a key incentive to excessive risk-taking in banks.**"

<i>SAFT</i>	2012	2011	2010
ROE	9%	18%	11%

Return on Equity for some sectors in the US [11]:

Secteur	ROE
Aerospace/Defense	21.60%
Chemical (Basic)	8.80%
Chemical (Diversified)	24.33%
Chemical (Specialty)	22.10%
Electrical Equipment	13.67%
Engineering	7.61%
Machinery	15.70%
Telecom. Equipment	15.67%

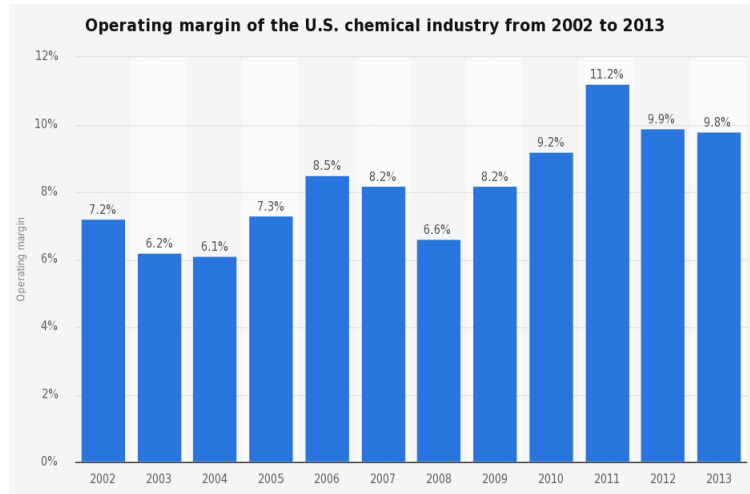
3.3 Operating margin

You can measure the activity profitability (or operating margin):

$$\text{Operating margin} = \frac{\text{operating income}}{\text{net sales}}$$

<i>SAFT</i>	2012	2011	2010
Operating margin	12%	14%	14%

Operating margin of the chemical industry in the United States from 2002 to 2013 [7]:



4 The company's solvency

A company solvency represents its capacity to pay its short-term debts (due within one year).

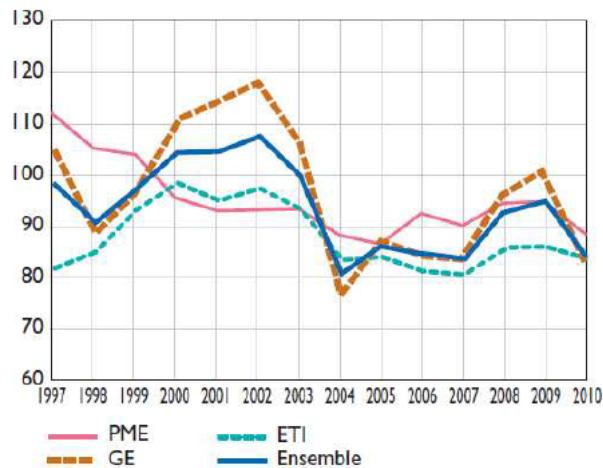
4.1 Debt ratio

$$\text{Debt ratio} = \frac{\text{financial debt}}{\text{equity}}$$

Equity here is shareholders' equity

<i>SAFT</i>	2012	2011	2010
Debt ratio	54%	25%	96%

Debt ratios for French companies [6]:



4.2 Working capital requirements

Before selling any services or products, a company will incur costs and **use funds** to build up inventories or deliverables that haven't been paid yet. On the other hand, charges incurred but not yet paid by the company or payment for sales not yet delivered are **sources of funds**.

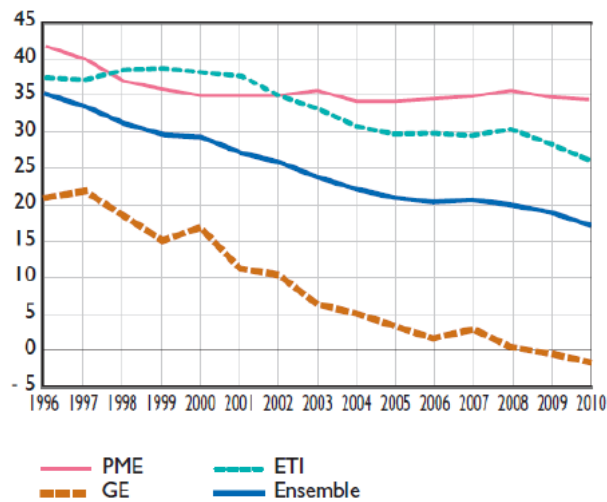
The **working capital** of a company is the netting of the two elements above.

Days working capital describe the period require to the company to "transform" its working capital into sales.

$$\text{Days working capital} = \frac{\text{average stock} + \text{trade receivables} - \text{trade payables}}{\text{sales}} \times 365$$

<i>SAFT</i>	2012	2011	2010
Days working capital	61	45	38

Days working capital, in France [6]:



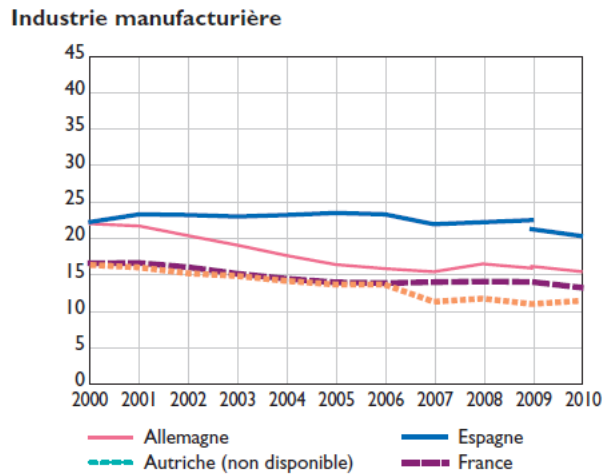
5 Structural ratios

5.1 Financial debts weight

$$\text{Financial debts weight} = \frac{\text{financial debts}}{\text{total assets}}$$

<i>SAFT</i>	2012	2011	2010
Financial debts weight	22%	9%	33%

Financial debts weight in % [12]:



5.2 Leverage ratio

The leverage ratio indicates how much the company has been using debt to finance its activity and its remaining margin to access more debts (its remaining leverage is very limited if the ratio is greater than 1):

$$\text{Leverage ratio} = \frac{\text{long and mid-term debts}}{\text{equity}}$$

<i>SAFT</i>	2012	2011	2010
Leverage ratio	0,98	0,66	1,36

6 Two basic ratios

Two basic ratios can be computed easily from any annual report. Those two ratios could be used to build a simple bankruptcy prediction model.

6.1 Return on net assets

$$\text{Return on net asset} = \frac{\text{EBIT}}{\text{total assets} - \text{total liabilities}}$$

<i>SAFT</i>	2012	2011	2010
Return on net assets	18%	20%	22%

6.2 Liabilities to assets ratio

$$\text{Liabilities to assets ratio} = \frac{\text{total liabilities}}{\text{total assets}}$$

<i>SAFT</i>	2012	2011	2010
Liabilities to assets ratio	59%	63%	65%

7 Credit scoring

Credit scoring is usually a combination of several financial ratios (preferably uncorrelated) that have statistically proven in the past their default predictability power. It is a simple and rapid way of assessing the financial robustness of a company.

Usually each financial company has its own credit scoring method (hence one company can be attributed different score from different banks).

Credit scoring method is also widely used in the supply chain management. It is a key element to help the management decide on the length of the payment grace period. Indeed, the longer the payment delay from a customer (or supplier), the longer your company is exposed to non-payment risk. The payment delay is a form of inter-company credit. The French Ministry of Economic and Financial Affairs publish a report [16] establishing the inter-company credit at the 31th December 2011 around 30% of French GDP.

The role of a sourcing manager is also to go beyond the credit score of a supplier (or customer) and evaluate the management added value, its business model, opportunities and threats.

If you want to build a credit scoring, you could use the four ratios mentioned in chapter 8.2.

8 To go further

8.1 "Perfect financial market" applied to financial analysis

In economics, the notion of financial **market efficiency** means that all publicly available accounting information on a company is directly incorporated by the market participants. Under assumption of market efficiency, a firm bankruptcy can be correctly predicted just monitoring market variables as:

- **excess return** (how the firm's shares outperform the market)
- **relative size** (compare each firm's equity value to the rest of firms on the market)
- **volatility** (the stock's volatility)

and accounting variables would only add little predictive power [17].

8.2 SME default probability: four ratios under scrutiny

From the economic academic literature [18], we can focus on 4 ratios that are significant to determine the default probability of an SME (based on a sample of 1003 German SMEs over the period 1996-2004, but we have to note that they don't test all available ratios available in the BACH database²).

The four ratios find in this research are in line with Moody's RiskCalc "forward-looking default probability" index:

1. **Personnel expenses over sales** = $\frac{\text{personnel expenses}}{\text{sales}}$
2. **Net income over total assets** = $\frac{\text{net income}}{\text{total assets}}$
3. **Supplier Target days** = $\frac{\text{supplier debts}}{\text{merchandise purchase}} \times 365$
4. **Depreciation over sales** = $\frac{\text{depreciation}}{\text{sales}}$

SAFT	2012	2011	2010
Personal expenses over sales	29%	34%	35%
Net income over total assets	4%	7%	4%
Depreciation over sales	7%	5%	5%

²Bank of the Accounts of Companies Harmonized

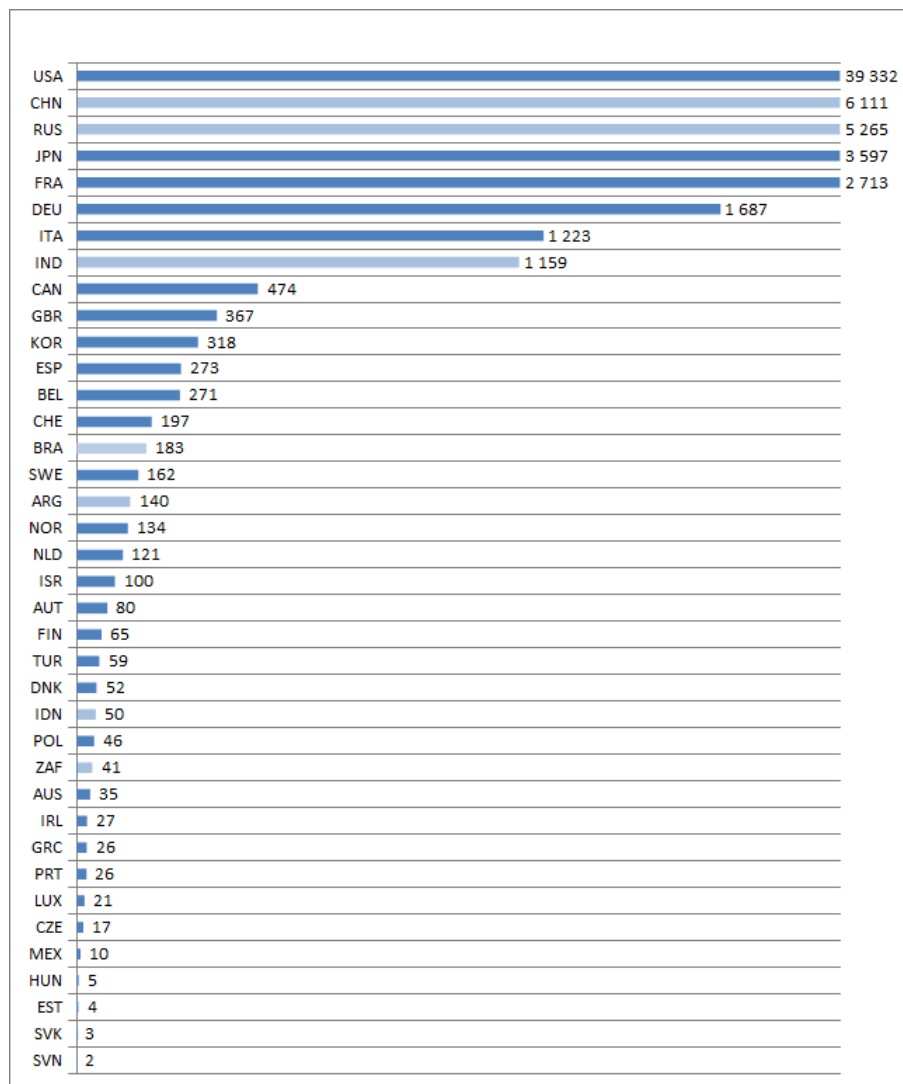
8.3 Macroeconomic influence

Finally, when assessing firms robustness you have to put this into the firm's region macroeconomic context [19]: "This paper studies the relationship between macroeconomic fluctuations and corporate defaults. [...] Our analysis shows that firm-specific factors are useful in ranking firms' relative riskiness, but that macroeconomic factors are necessary to understand fluctuations in the absolute risk level."

9 Space Economics - Overview

9.1 Budgets

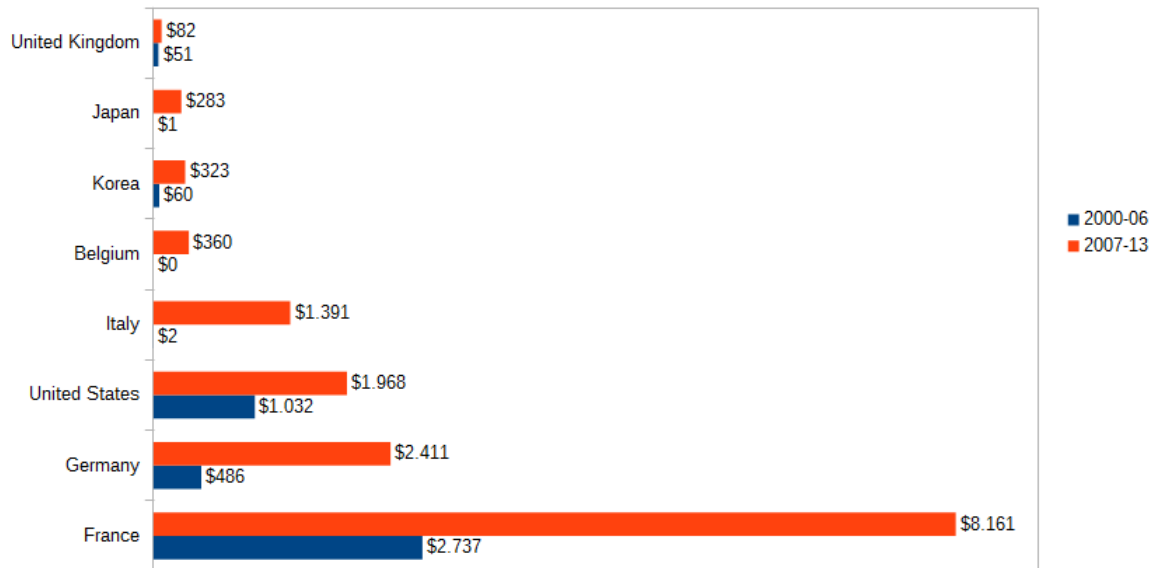
National space budget in current Million USD in 2013 [21]:



9.2 Top OECD exporters of satellites and launch vehicles

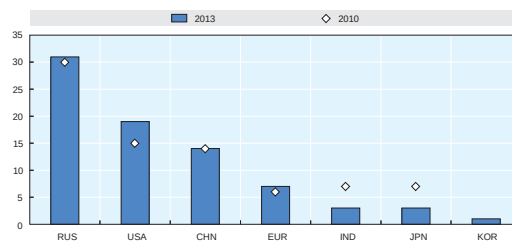
Top OECD exporters of satellites and launch vehicles

In million USD (current)



9.3 Launches per country

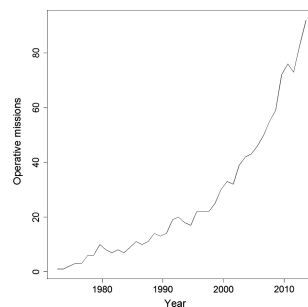
Russia is launching the most in 2013 [21]:



9.4 Remote sensing

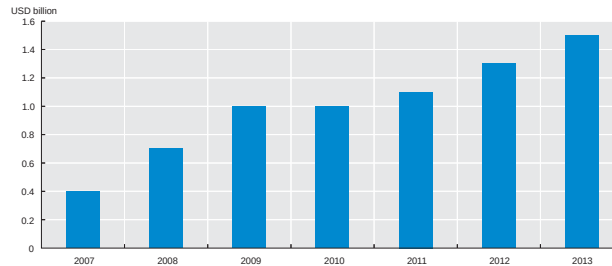
9.4.1 Operational

Here are represented the number of **operational** near-polar orbiting, land imaging civilian satellites [24]:



9.5 Estimates of commercial remote sensing revenues

The commercial exploitation of Earth Observation is increasing [21]:



Two big players are dominating the market of commercial satellite imaging: DigitalGlobe and Airbus Defence & Space.

Since 2013, Planet Labs and Skybox are disrupting the economics of remote sensing. There are trying to bring to their customers near-real time imaging of virtually any spot on Earth. There are targeting customers that need to monitor:

- borders
- transportation fleets
- power plant exhaust

9.5.1 The Avanti case - 2015

As reported in SpaceNews:

Satellite fleet operator Avanti Communications Group on May 12 said its three-satellite fleet, principally the Hylas 1 and Hylas 2 satellites launched in November 2010 and August 2012, were between 15 percent and 20 percent full during the three months ending March 31.

Despite this relatively low utilization, London-based Avanti said it was in a hurry to launch its Avanti 3 and Avanti 4 satellites as soon as possible "to prevent [the company] from being capacity constrained, in addition to addressing new markets."

In a statement to shareholders, Avanti said revenue for the nine months ending March 31 from its three satellites totaled \$48.9 million, up 26 percent over the same period a year ago.

At constant currency-exchange rates – which would remove the effect of the strengthened U.S. dollar during the period – Avanti said its revenue increase was 54.5 percent after one-time items. These items a year ago included revenue from a European Space Agency grant, apparently related to Avanti's purchase of the agency's Artemis data-relay satellite.

Avanti's fiscal year ends June 30. The company had told investors in February that the unexpectedly poor revenue performance for the six months ending Dec. 31 would reverse later in the year.

Avanti in February reported six-month revenue, to Dec. 31, of \$31.1 million. The implied performance for the three months ending March 31 was \$17.8 million. Avanti said the three-month figure resulted in an EBITDA, or earnings before interest, taxes, depreciation and amortization, of \$1.6 million. The company reported an EBITDA loss for the first six months of its fiscal year.

The company said its backlog as of March 31 was \$415 million, up 1.2 percent from Dec. 31. But the company advised investors not to pay much attention to backlog as the

company is signing contracts that are not the standard fixed long-term commitments common to the industry.

"The usefulness of this metric has reduced as Avanti has moved towards selling through framework contracts, under which customers start with low initial capacity commitments, but typically increase these on a regular basis," Avanti said. "Thus the business more closely resembles a telecoms company rather than a TV broadcasting business, and so backlog does not give a full indication of expected forward revenues."

Avanti's three satellites offer mainly Ka-band broadband links to government and enterprise customers in Europe, the Middle East and Africa.

Avanti's Hylas 1, launched in November 2010, has a total of 3 gigahertz of throughput, Avanti said. Hylas 2, launched in August 2012, has 11 gigahertz. Artemis, which is nearing retirement, has 1 gigahertz, the company said.

The fill rate of 15-20 percent for the three months ending March 31 compares to 10-15 percent a year ago, the company said.

The company's Hylas 4 satellite, under construction by Orbital ATK of Dulles, Virginia, has 28 gigahertz of Ka-band capacity. It remains on schedule for an early 2017 launch aboard a European Ariane 5 rocket.

Hylas 3 is not an entire satellite but a Ka-band payload that Avanti is placing on a data-relay satellite being built by OHB SE of Bremen, Germany for Airbus Defence and Space. Airbus is managing a data-relay service for the European Space Agency and the European Commission and is responsible for the satellite's manufacture and launch.

Hylas 3/EDRS-C's schedule has slipped from 2016; the satellite is not expected to be ready for launch until 2017. Avanti said it is "working with the supplier to recover the schedule, and remaining capital expenditure payments have been deferred until launch."

In early 2012 Avanti raised about 74 million British pounds (\$110 million at current exchange rates) to finance its share of the Hylas 3/EDRS-C construction and launch.

In addition to providing fleet fill rates for the first time, Avanti told investors a key performance indicator for the company is what it calls Top-20 Customer Bandwidth Revenue Growth. This measures revenue from "Avanti's current leading customers" on a rolling 12-month period. The company said revenue from these customers, which it did not quantify, was up 60.3 percent for the 12 months ending March 31 compared to the previous year.

Per-megahertz pricing has remained stable in all its markets, the company said, adding that it expects revenue growth to continue through the end of the current fiscal year and into 2016.

9.6 Order of magnitude

As a rough order of magnitude, to launch 1 kg in space, it costs around 30 K€.

Electric propulsion allows to roughly halve the propellant mass.

9.7 Barrier to entry

9.7.1 Difficulties to secure the capital before any launch

NewSat, a company in Australia in the Ka-band business encountered difficulties to secure capital. It would have launched the first privately owned Australian satellite. The initial market capitalization of the company was only around 100 million Australian dollars. The launch of its first satellite, Jabiru-1,

was repeatedly postponed and investors pulled back. The company was put under administration in early 2015.

9.7.2 The cost of insurance

ViaSat Technologies Limited signed a credit agreement with the Export-Import Bank of the United States to finance up to 85% of its manufacture, launch and insurance expenses for the ViaSat-2 Ka-band communications satellite.

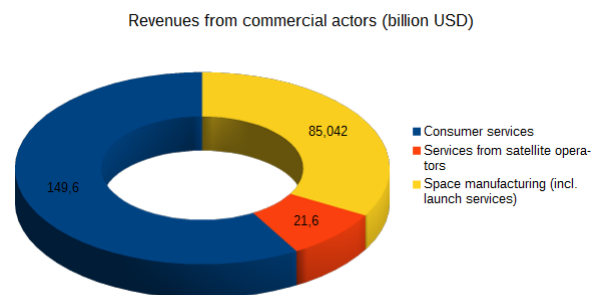
9.7.3 Business model relying on "single points failure" and regulatory risks

LightSquared has been delivering mobile satellite voice and data services to North America since 1995 over its MSAT-1 and MSAT-2 satellites. It has a third satellite: SkyTerra-1. This illustrates that once a satellite is up and running, it generates cash, but it is a "single point failure" in the sense that if it fails in orbit, the business model vanishes. In early 2015, LightSquared was under Chapter 11, after regulators blocked its plan for its wireless network, whose business model was based on delivering low-cost mobile services to American citizens. The frequencies LightSquared planned to use could potentially have interfered with the GPS signals.

10 Commercial applications

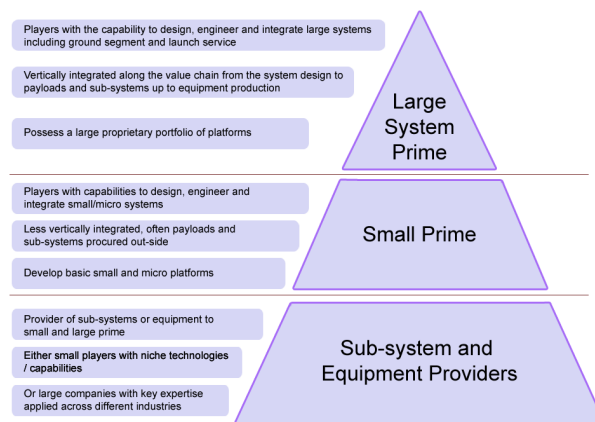
The commercial applications revenues can be split as follow [21]:

- Consumer services
 - Satnav (\approx one-third of consumer services revenues)
 - Direct To Home (\approx two-third of consumer services revenues)
 - Very Small Aperture Terminal (VSAT)
- Services from satellite operators
 - FSS (\approx 55% of services revenues)
 - MSS (\approx 12% of services revenues)
 - Remote sensing
 - Sat radio
 - Sat. Broadband
- Space manufacturing (incl. launch services)
 - Space manufacturing, ground and space
 - Launch services (\approx 6% of manufacturing revenues)



11 Value Chain Mapping

Here is a view on the vertical segmentation of the Upstream Space segment [22]



11.1 How to map a value chain

1. list the functions of the space industry
2. list the actors and sort them per functions

Functions:

- manufacturing
- launch services
- satellite capacity lease or sale
- ground equipments and terminals
- services

Actors	Sat. integrator	L. manuf.	L. operator	S. operators	Service providers
Sat. Manufacturing	x				
Launch services		x	x		
Capacity lease			x		
Ground equipments					
Value added services					x

11.2 Main actors

Satellite integrators in Europe:

- Airbus D&S and SSTL
- Thales
- OHB

Launcher Manufacturer and operator in Europe:

- Arianespace

Satellite operators in Europe:

- Eutelsat (France)
- SES (Luxemburg)

- Hispasat (Spain)
- Paradigm (UK)
- Inmarsat (UK)
- Avanti (UK)
- O3B (Jersey)
- Telespazio (Italy)

Ground equipment and terminals:

- Cobham (UK)
- etc.

Service providers:

- Astrium Services
- Telespazio
- Many start-ups

11.3 Space Value Chain order of magnitude

Space Value Chain (as of 2008) in billion USD[23]:

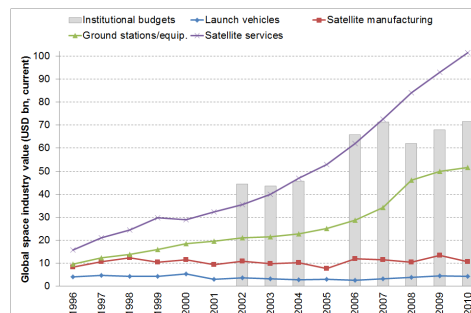
	Telecommunications	Earth Observation	Navigation
Satellite Manufacturing	3,6	0,4	
Launch services	2,7	0,2	
Capacity lease or sale	11	0,9	
Ground equipments	10	0,2	10
Value added services	73	1,6	15

Observed typical EBIT margin (from annual reports):

Satellite Manufacturing	4%
Launch services	4%
Capacity lease or sale	30%
Ground equipments	N/A
Value added services	very variable

11.3.1 Evolutions

Global space industry value [25]:



12 Conclusion

A Procurement Manager in the Space industry can compute some financial metrics proposed here and maintain an updated database of monitored suppliers and potential partners.

This monitoring will be very helpful to spot out-of-family values and start investigating more on a specific company to assess the risk of entering long-term deals.

We introduced some figures about the Space economy and some details about the Space sector value chain. These should give some ideas about the sector dynamism and attractiveness for future graduates.

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