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SPACE INNOVATION

Space for Finance

New Space Economy

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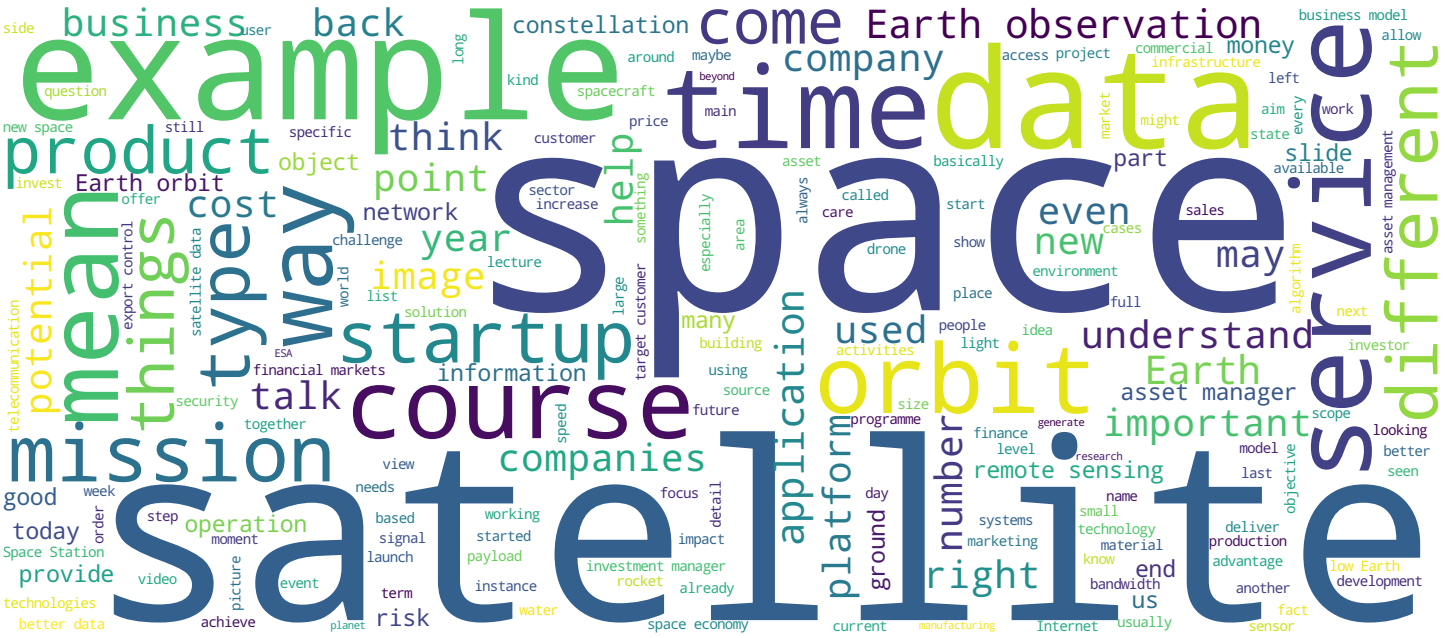

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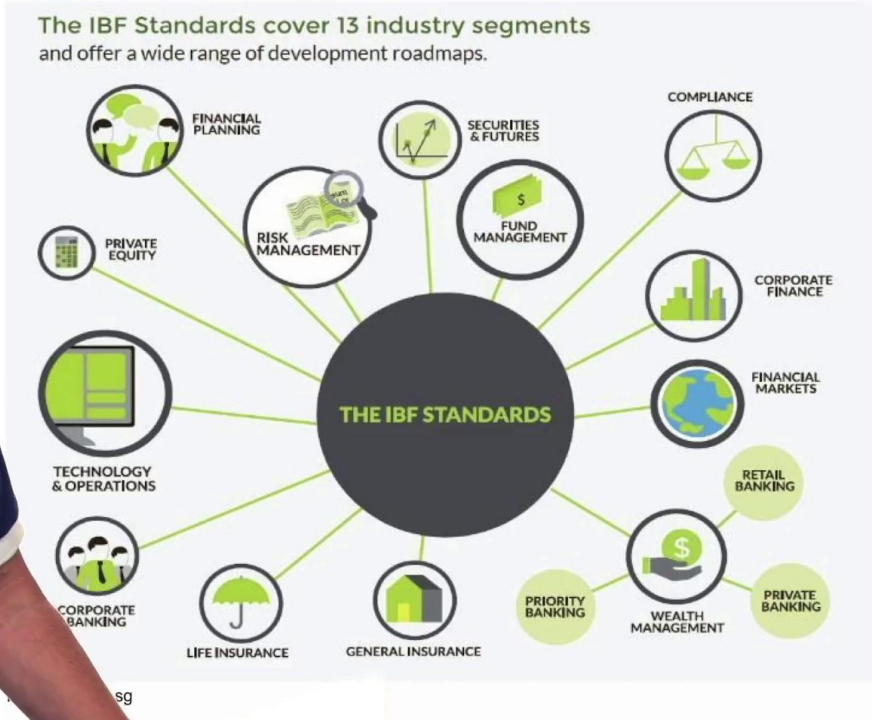
What is “Finance”?



Welcome back to another lecture where we'll explore how space technology can help an existing industry right here on Earth. This time, we will talk about finance. Now that's a very big field encompassing lots of things. I tried to see whether somebody smart had taken a step at showing the various segments of finance, and found this image on my side from the IBF in Singapore. In your daily lives, you're surely all familiar first-hand with retail banking and things like credit cards, and maybe even mortgages. And space already plays a role here. For example, GPS is used by ATMs for transactions. But look at all of the other activities shown here. For example, corporate finance, that's essentially investment banking, and the various types of insurance that you already heard about in another lecture. In fact, in this lecture, we will focus mostly on what is called asset management. That is not directly on this slide, but it's implicit in a few other categories shown here, things like fund management, private equity, and wealth management. Okay, so the next question here is, what is asset, or sometimes also called, investment management?

Notes

Summary

0m 05s

What is asset (or investment) management?

- Stewardship over assets for a client, following a policy defined by such client
- ASSETS can be e.g. stocks, real estate, currencies, cryptocurrencies, intellectual property, etc.
- It can be *active* or *passive*
- POLICY contains objectives, constraints, and other considerations
- Objectives almost always contain such concerning return and risk
- In order to manage towards a certain risk and return objective, an active manager needs to have a view on future outcomes

Well, it's actually as the words imply, you manage assets, either your own or those of a client. There are many types of assets, and we list some of them here. Most of you will be familiar with asset managers who manage stock portfolios. It's actually what I used to do in a previous career. Nowadays, I have a venture fund that invests in early-stage space companies, and that is a form of asset management too. But you can manage many different types of assets, things like cryptocurrencies or even our intellectual property. Whatever the asset manager manages, he or she will usually follow an investment policy which contains the objectives the client wants to achieve, as well as usually some constraints. For example, maybe you don't want to invest in certain things. Return and risk objectives are the most usual and prominent ones. How much money do you ideally want to make and how much risk are you willing to take to achieve that return objective? Now if you think this through, it should be fairly obvious that in order to manage towards a certain return and risk of investment, the investment manager needs to have a view of the distribution of future outcomes of that investment, of the returns, that is.

Notes

Summary

1m 25s

What is asset (or investment) management?

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For that return distribution, you can obviously calculate an expected value. And the second moment, that is, the standard deviation is typically used in finance as a measure of risk. All right, on we go. Bear with me as we will now tie this back to space.

Notes

Summary

2m 43s

How can an active asset manager get a superior view on the distribution of future outcomes?

- Better data
- Better models
- Better inferences (incl. better psychology = elimination of biases)

So the next question is, how can an asset manager get a superior view on the distribution of future outcomes? And when I say superior, by the way, I mean superior to other asset managers because you will only make money if you do better analysis than other asset managers. If everybody does the same analysis and comes to the same conclusions, that means that the price of the asset will already reflect those views, and there will be no way for anybody to make any extra money. Now from a very high level point of view, you can essentially boil down the sources of such competitive advantage, that is, superior analysis, to three big categories. You can have better data. We will talk about this in a moment. So that's one. Two, you can have better models that use that data to project the outcomes that we want. And lastly, you can make better inferences from the analysis. This is where the human factor really comes in and things like psychology and especially what we call biases in psychology, but that's beyond the scope of this course. Okay, but I promise I would tie this back to space. Where do you think space can help you? Which of the three categories will it come in? And I think that's probably obvious.

Notes

Summary

2m 59s

How can an active asset manager get a superior view on the distribution of future outcomes?

- Better data
- Better models
- Better inferences (incl. better psychology = elimination of biases)

SPACE can help by providing BETTER DATA

Space can generate all sorts of additional data. That is, you can end up with better data and much more data. And now just to be complete, I should point out that this also means that space may indirectly help you to get to better models too, and this is because if you are using something like machine learning models, those typically improve the more and the better data you have.

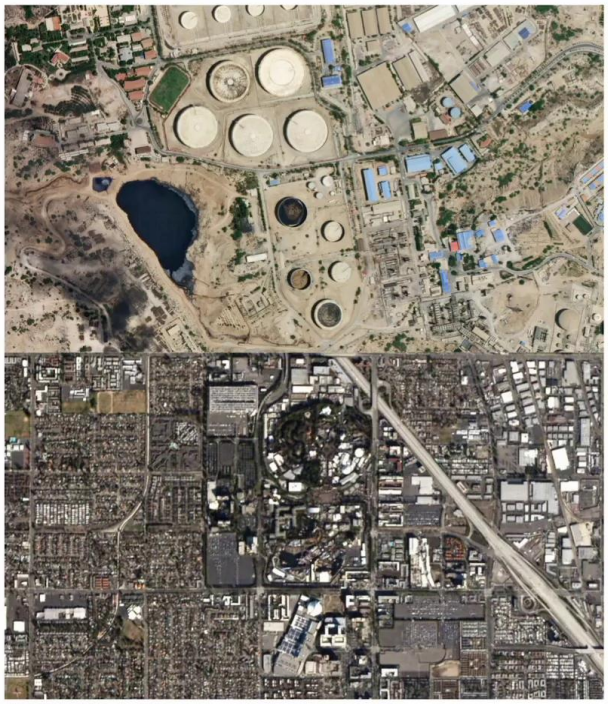
Notes

Summary

4m 15s

Earth observation data examples

- Crop monitoring
- Parking lot occupancy at malls, big box stores, amusement parks, etc.
- Oil storage tank levels
- Mining output
- Port level of activity
- Construction site progress
- Disaster aftermath
- Building occupancy
- Industrial facility level of activity
- ESG compliance



Images: Planet Labs

Okay, so let's look at this in a little bit more detail then. For our purposes, space data is mostly about data generated by remote sensing or what we sometimes call Earth observation, and the satellites. I'm saying mostly, as one could argue that there's also Internet of Things type data, which may have been collected with the help of satellite constellations. But let's focus on remote sensing here. This page gives you just a few examples of the types of data you can collect that may be helpful in investment analysis. Let me actually just go through the pictures on this slide here. On the upper right, you have oil tanks, and there's actually algorithms that can look at the shadows of the oil tanks and basically judge how full these tanks are. And this is valuable information for commodity analysts who are following this type of thing. On the lower right, you have actually Disneyland in California. And one thing you could do here is look at the parking lots around Disneyland, and use an algorithm to count how many cars are in there. And this may also be valuable information for financial analysts who are trying to judge how well Disney is doing in its theme parks division.

Notes

Summary

4m 41s

Earth observation data examples

- Crop monitoring
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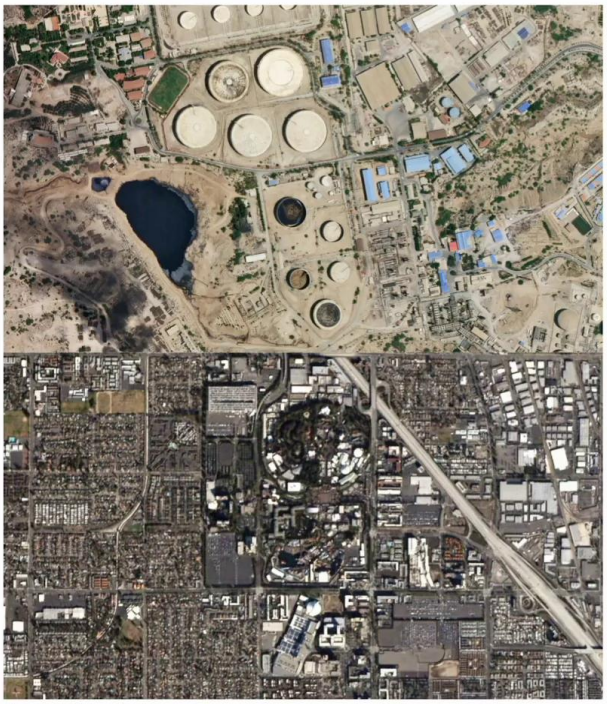


Images: Planet Labs

And there's a whole lot of other things, and frankly, it's only limited, one, by your imagination, and of course, secondly, by the available technology. And you see various other examples here listed on the left, which I won't go through in detail. Now there's a number of companies which have been doing this type of analysis already for a number of years now, that is, analysing satellite imagery specifically with the use cases for investment managers as a target customer in mind. And one prominent such company is called Orbital Insight.

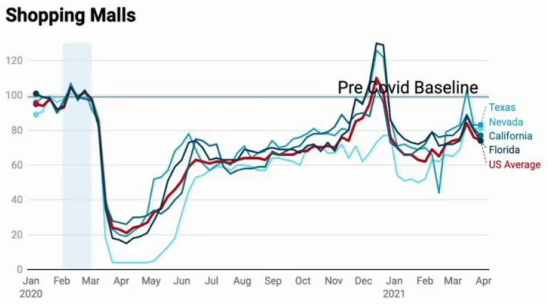
Notes

Summary

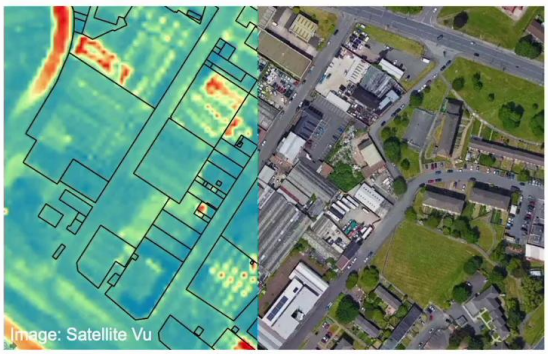
5m 49s

Earth observation for finance – further considerations

- Sensor types – all of them!
  - Optical
  - Infrared
  - Hyperspectral
- As always, EO business models can be upstream-only (satellites), downstream-only (data analysis) or vertically integrated
- Important: clients typically want **actionable insights**, not raw data



Source: Orbital Insight



Okay, just one slide to remind ourselves of remote sensing technology, and you can theoretically use any kind of remote sensing sensors here, as long as it provides the investment managers and the customers with useful insights. And speaking of Orbital Insights, the company I just mentioned, you can see here on the upper right how they took some of their data, this is counting cars and shopping malls, I'm guessing, and started doing some very basic analysis, plotting that data over time, and setting a pre-COVID baseline at 100 in January 2020. This is just a very simple example of what I mean when I stress that customers want insights rather than some raw data from space. In fact, bluntly speaking, they don't really care that the data comes from space. In fact, having been an investment manager previously myself, and hence, a potential customer, let me make that point very clearly. As an investment manager, I don't care where the data comes from, as long as it provides me with some value-added insight that either helps me make money or avoid losing money. On the lower right, you can see an example demonstrating the potential of other types of sensors.

Notes

Summary

6m 23s

Earth observation for finance – further considerations

- Sensor types – all of them!
  - Optical
  - Infrared
  - Hyperspectral
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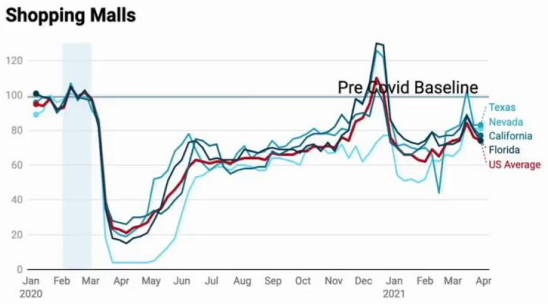
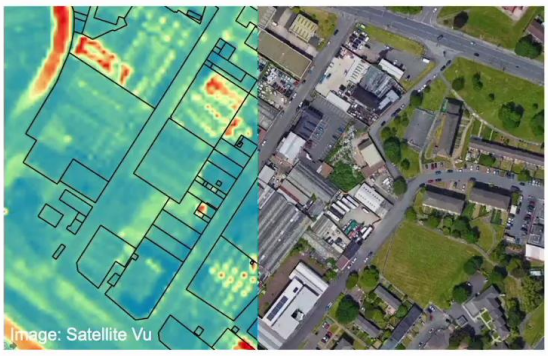
- Important: clients typically want **actionable insights**, not raw data



Source: Orbital Insight



Specifically here, it's an image that shows the potential of thermal infrared images, which is the left part of the image, and thermal infrared can detect temperature differences. So what can you use that for? Well, for example, you could observe industrial facilities, as is actually this example here. And you can look at the heat in parts of the industrial facility to gauge the level of activity that's going on here. And you see the red spots are basically spots which are hotter, and there's presumably something happening inside that industrial facility.

Notes

Summary

7m 31s

Other space tech use cases for finance

- Faster data for high frequency trading
  - Speed of light c in vacuum vs. in fiber

Beyond asset management:

- Ultra-secure data storage and processing
  - Sensitive customer data
  - Blockchain nodes

Let's finish up mentioning just a few other examples of non-remote sensing use cases for financial markets customers. And you are by now surely aware of the various projects that aim to build global satellite communication constellations in low Earth orbit, such as SpaceX's Starlink, or Amazon's Kuiper. Because those constellations will operate in low Earth orbit where they have lower latency than for example, going all the way to geostationary orbit and back. And those satellites are also intended to be connected to each other via inter-satellite laser links. And because the speed of the light in vacuum is significantly faster than the speed of light in fiber, it means that if you need to communicate over a long enough distance, it will be quicker via satellite than via traditional fiber path on Earth. You can use that advantage in financial markets in what we call high frequency trading. We will not go into detail here, that's beyond the scope of the course. But suffice to say, here you effectively create an advantage by having better data, specifically by having data faster than the other traders in the financial markets. Beyond trading and asset management, there's some other ways where space tech may help financial markets.

Notes

Summary

8m 05s

Other space tech use cases for finance

- Faster data for high frequency trading
  - Speed of light c in vacuum vs. in fiber

Beyond asset management:

- Ultra-secure data storage and processing
  - Sensitive customer data
  - Blockchain nodes

For example, there are now proposals for ultra-secure data centres in space, and one target customer group are financial institutions for their sensitive data. There are also some startups, for example, a company called SpaceChain, that aim to put blockchain nodes into space. And as always with space, at this point in time, there's probably a lot of potential business models that could leverage space tech for financial markets that have not been thought about yet. But it's worth trying to brainstorm because this is one customer group with a lot of money to spend if you can find something that offers value to them. So I encourage you to try to do that.

Notes

Summary

9m 16s