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Alternative Data for GI pricing

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Why this conversation now?

- Conversation has moved on from Big Data to more targeted uses cases of data.
- Insurance pricing should be data driven supplemented with judgement. There is a long way to go, particularly for commercial pricing.
- Alternative data could lead to:
  - Improved underwriting experience
  - Improved pricing refinement
  - Faster and more accurate claims settlement
- In the investment industry, alternative data is well established. Hundreds of millions (USD) spent a year on alternative data in the search for ‘alpha’.

What data is currently used?

- Personal lines: Proposal form data supplemented with…
  - Vehicle data
  - Personal data
  - Financial data such as credit scores
  - Property data (natural perils)
  - Property data (building specific)
- Commercial lines: Proposal form data supplemented with…
  - Property data (natural perils)
  - Some corporate and financial data
  - Limited use of specialist look-ups
  - Qualitative risk reports

Data augmentation

- Data augmentation is a grey area which starts at data backfill.
  - Example of backfill might be car details from DVLA for motor.
  - Example of augmentation might be flood score from proprietary provider for home.
  - The theoretical split between backfill and augmentation is likely to relate to how much the policyholder knows about what is happening.
- Advantages of data augmentation include:
  - For information known to the policyholder, saves policyholder time where it can be separately sourced / verified.
  - For information not known to the policyholder, adds new information that can support pricing.

What is alternative data?

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- Aggregator data
- Telematics data
- Home IoT device data
- Existing policy and claims data
- Third party company scores and review data
- Media / News data
- Risk evaluation data
- Companies house data
- Social network data
- Government data

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What is the data business model?

- Data providers
  - Unique data sets – from hardware or historical advantage
  - Scraped data sets – ubiquitous but not easily collated
  - Tidied up data sets – available but not always directly applicable
- Data pipelines
  - Data sets sold as a flat file or pay per click.
  - Preferred pipelines links to type of business as well as data use.
  - APIs as well as conventional feeds depending on velocity of data need.
- Difficulties may include IP issues where data ownership may be questioned or data ownership needs to be protected.

New data: Data Engineering

- Most technical challenges relate to live pricing environments where volume is high – such as current personal lines but in future likely for SME commercial.
- Two common challenges:
  - Ingesting large databases.
  - Use of API calls for live/on demand data.
- There is an increased need for actuaries and data scientists to work with developers to implement data collection, live pricing and data storage.
- There are different data challenges for low volume business though typically this might not called be called ‘data engineering’.

Data Engineering – large databases

- Postcode level data in the UK comes with 1.7 million rows. Property level data comes with ~30 million rows. This is beyond Excel.
- To match these data files with other data, either database queries (Access, SQL, NoSQL, etc) or programming tools like R or Python are needed.

Data Engineering - APIs

- Many suppliers of data will use RESTful API's
  - Advantages:
    - Supplier manages updates, live access to latest data.
    - Get only what you need – possibly a price per click, manageable data volumes.
- RESTful API's – essentially http requests, as for a webpage:
  - E.g.: https://dvlasearch.appspot.com/DvlaSearch?apikey=DvlaSearchDemoAccount&licencePlate=mt09nks

Data Engineering - APIs

- New skills – ability to programmatically run multiple web queries: R, Python, curl etc.
- Understanding how to parameterise the queries to get the appropriate data.
- Programmatically reading the responses – json/XML files are common – and loading the relevant fields to match to other data.
- Link data from multiple sources.

{"taxed":false,
"mot":true,
"dateOfFirstRegistration":"23 JULY 2009",
"yearOfManufacture":"2009",
"make":"VOLKSWAGEN",
"model":"TIGUAN SE TDI 4MOTION",
"fuelType":"DIESEL",
"sixMonthRate":"",
"twelveMonthRate":"",
"cylinderCapacity":"1968 cc",
"wheelPlan":"2-AXLE-RIGID BODY",
"revenueWeight":"Not available",
"taxDetails":"Tax due: 01 February 2019",
"taxStatus":"Not taxed",
"colour":"SILVER",
"typeApproval":"M1",
"co2Emissions":"167 g/km",
"motDetails":"Expires: 10 May 2019",
"numberOfDoors":5,
"vin":"XXXXXXXXXXXXXXXXX",
"transmission":"MANUAL"}

Data Engineering - APIs

- Response structure can be more complicated – an example json:


```
{
  "make": "VOLKSWAGEN",
  "model": "TIGUAN",
  "dateFirstUsed": "23 JULY 2009",
  "fuelType": "DIESEL",
  "colour": "SILVER",
  "engineSize": "1968",
  "registrationDate": "23 JULY 2009",
  "manufactureDate": "23 JULY 2009",
  "manufactureYear": "2009",
  "motTestReports": [
   {
    "testDate": "11 MAY 2018",
    "expiryDate": "10 MAY 2019",
    "testResult": "PASS",
    "odometerReading": 88237,
    "odometerUnit": "mi",
    "motTestNumber": 246230668405,
    "advisoryItems": [
      "Front Tyre worn close to the legal limit  Both (4.1.E.1)",
      "Rear  Both Tyre a have low cut on tread","Front Anti-roll bar linkage ball joint dust cover damaged, but preventing the ingress of dirt  Both (2.4.G.2)"
    ],
    "minorItems": [],
    "failureItems": []
   },
   {
    "testDate": "11 MAY 2018",
    "expiryDate": "",
    "testResult": "FAIL",
    "odometerReading": 88237,
    "odometerUnit": "mi",
    "motTestNumber": 436849190066,
    "advisoryItems": [
      "Front Tyre worn close to the legal limit  Both (4.1.E.1)",
      "Rear  Both Tyre a have low cut on tread",
      "Front Anti-roll bar linkage ball joint dust cover damaged, but preventing the ingress of dirt  Both (2.4.G.2)"
    ],
…
```

Data Engineering – missing data

- Data provided from API's is often "raw".
- Missing data is a common problem. Depending on the API, the responses to individual fields may be missing, the fields themselves may be missing.
- Different responses may have different combinations of fields.
- Need to handle exceptions – impute/ask/default/decline?
- Response time can be an issue – e.g., when supplying an aggregator.

{"taxed":false,
"mot":true,
"dateOfFirstRegistration":"23 JULY 2009",
"yearOfManufacture":"2009",
"make":"VOLKSWAGEN",
"model":"TIGUAN SE TDI 4MOTION",
"fuelType":"DIESEL",
"sixMonthRate":"",
"twelveMonthRate":"",
"cylinderCapacity":"1968 cc",
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"co2Emissions":"167 g/km",
"motDetails":"Expires: 10 May 2019",
"numberOfDoors":5,
"vin":"XXXXXXXXXXXXXXXXX",
"transmission":"MANUAL"}

Data Engineering – data storage

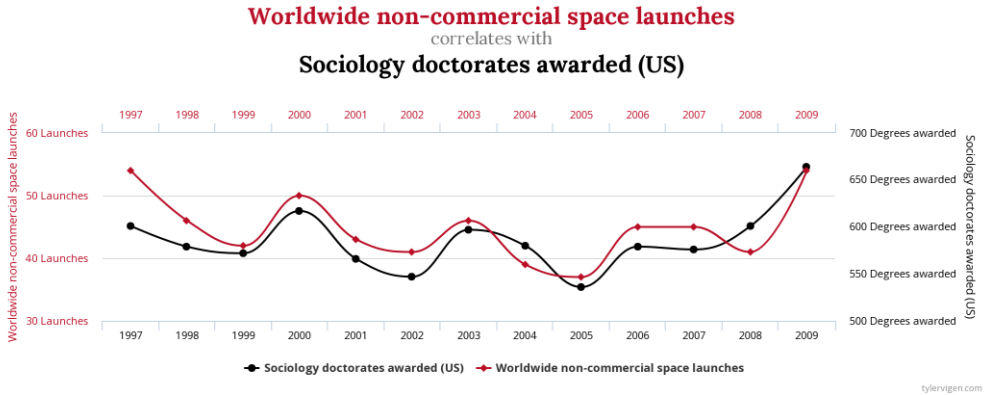
- Even if you are only using a couple of fields in the API response to price on, you might want to save the entire response in order to look for correlations in the future.
- API responses with many potential fields have to be stored in a data warehouse.
- For frequently refreshed data, the data may need to be collected or monitored by time.
- This can lead to “big data” – e.g. telematics raw data.

New data: Data Science

- So you now have lots of new data, so what? **Is it predictive?**
- Prove value by historical claims analysis
  - Can you backfill the data to match your back-book?
  - Potentially many gaps – can you impute?
  - If not, can you make a case to collect for future analysis?
- Short term vs long term value
  - First movers may get significant advantage, but value may change once market uses new data as standard
  - On the other hand, if you don't get data that becomes market standard, a high risk of being selected against.
- Cost of data vs Value from data – what is the appropriate ratio?

Data Science – correlations

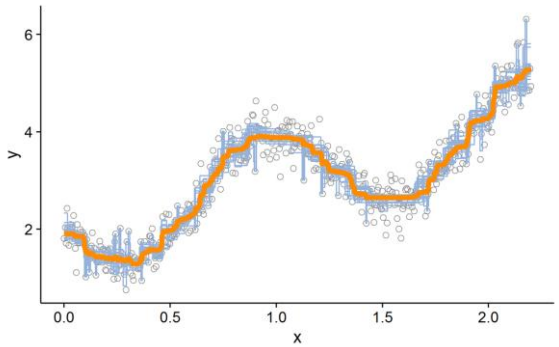
- A statistical exercise of finding a signal
  - With multiple new fields, the chance of a variable looking predictive by chance is much increased.
  - Look at correlations, but bear in mind that correlation does not imply causation. Understanding how predictions generalise to unseen data is crucial – use test sets or cross-validation.

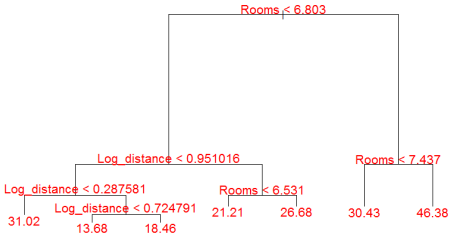


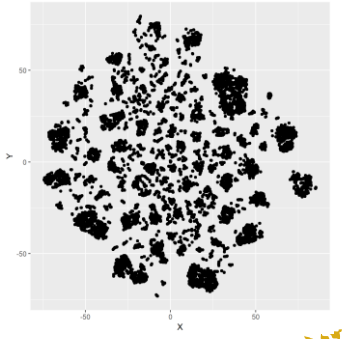
www.tylervigen.com/spurious-correlations (CC licence)

Data Science - techniques

- Use new predictive models – e.g., gradient boosted models, random forests, neural networks, support vector machines. R or python are useful here.
- Use unsupervised analysis (clustering, dimensionality reduction) to look for interactions affecting just small proportion of data, or complex interactions.

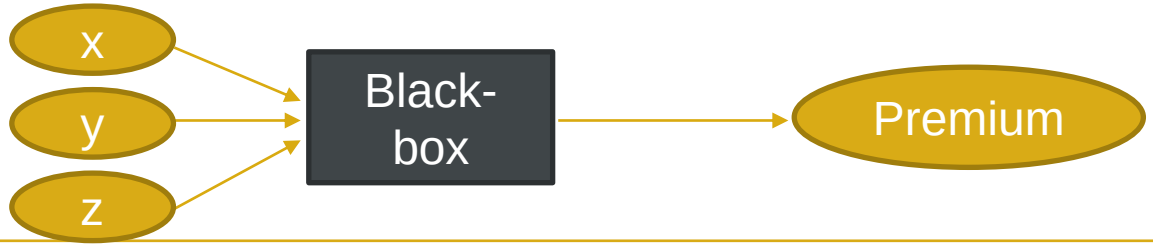






Data Science - transparency

- Advanced and flexible models can be difficult to interpret – black-box like.
  - Can you explain to other stakeholders?
    - data visualisation – one-way plots,
    - developing approximate but transparent models (e.g., GLMs) to explain trends,
    - communication of test results.
  - Are you certain that the routine is not discriminating on, e.g., Gender or Race? Can you demonstrate this to a regulator?



So what now…

- We should think more about data engineering within our underwriting and pricing frameworks.
- In a blog last year we talked about data actuaries (and finance actuaries). I think this is an increasing trend.
- Seek out opportunities within your firms to get involved with proof of concept work.
- Our previous talks on parameter error and increasing statistical robustness in London Market pricing (at GIRO and LMAG) align to data adding value.
- More data means more modelling, and more actuarially focused pricing. This is good news for the profession!

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