Revolut Technical Hometask

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Investigation into reduction of KYC pass rates

As a financial institution regulated by the FCA, Revolut is obligated to verify the identity of all customers who open an account. Each prospective customer must pass a Know Your Customer (KYC) process by submitting a government-issued photo ID and a facial picture (checks undertaken on behalf of Revolut by 3rd party partner, Veritas). Pass rates of these checks have decreased significantly lately. This report aims to:

- **Outline root causes of the decline in overall pass rates**
- **Suggest solutions to improve overall pass rates**

Account openings & KYC Methodology

Account openings have increased strongly over the last period

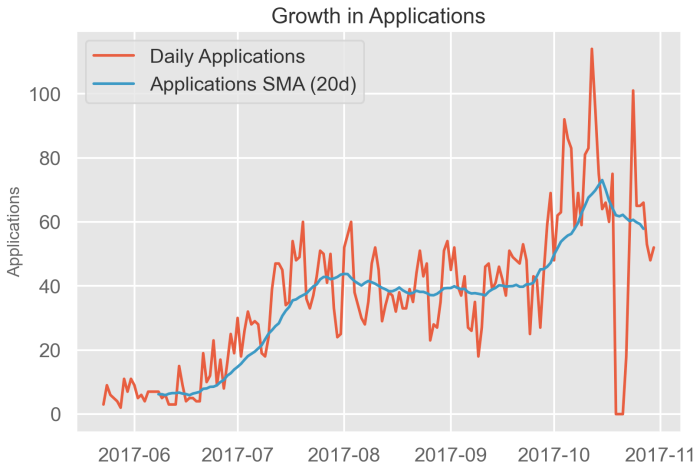

Fig 1. Number of account applications per day

- An increase in daily account openings of ~6x during the period reflects growing market awareness and subsequent demand for Revolut services
- Likely business objectives framed under FCA-mandated and organizational KYC guardrails are: comply with (i) laws and regulation, (ii) internal enterprise risk management framework and (iii) convert all non-fraudulent account openings made into active accounts to help promote organic growth

Veritas as sole provider of KYC account openings checks for Revolut is a potential single-point-of-failure for KYC compliance and growth tied to new business acquisition

Veritas KYC checks

- Veritas performs two checks (The Two Checks) for prospective customers to progress to account opening and onboarding:
  - i. **Document Report Check**: To verify the photo ID is valid and authentic;
  - ii. **Facial Similarity Check**: To verify that the face in the picture is the same with that on the submitted ID
- Customers 'pass' the KYC process and are onboarded if results of *both Document and Facial Similarity Checks are 'clear'.* If the result of any check is not 'clear', the customer must submit all photos again

Document checks

- The Document Report Check is composed of data integrity, visual authenticity and police record checks. It checks the internal and external consistency of identity documents to identify potential discrepancies
- The Document Report Check combines *software* and an *expert team* to maximise fraud detection. Most documents will be processed instantly. However, when document analysis falls back to *expert review*, the report status will be delivered asynchronously via webhook notifications

Facial similarity checks

- The Facial Similarity Check compares the most recent live photo or live video provided by applicants to the photos in most recent identity documents provided
- A score is given between 0 and 1 that expresses how similar the two faces are, where 1 is a perfect match. If the report is completed manually or image integrity fails, scores will be omitted. The score only measures how similar the faces are and does not make assessments of the nature of material submitted. If tampering is detected the applicant will be rejected independently of the facial similarity score

Data analysis

Pass rates have declined more than could be expected under normal conditions

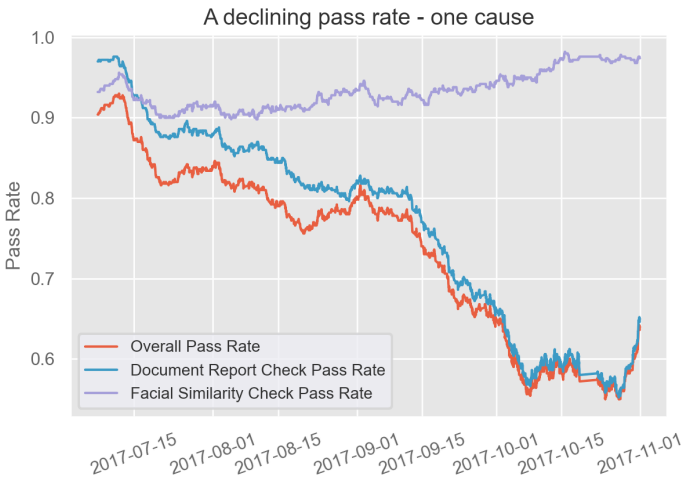

Fig 2. Illustrates overall pass rate together with pass rates for the two conditional factors: Document Report Checks; Facial Similarity Checks

The declining overall pass rates of KYC checks have been caused entirely by a decline in the Document Report Check's (DRC) pass rates. The overall KYC pass rate is defined as the number of customers passing KYC process divided by number of customers who attempt account opening.

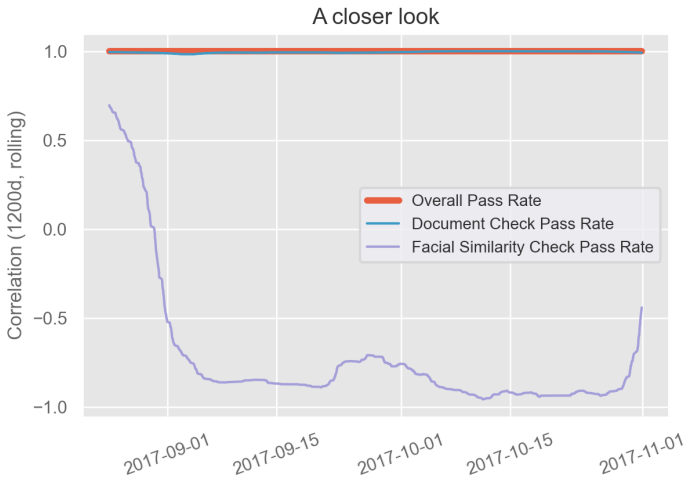

Fig 3.1,500d rolling correlation between the two conditional pass rate factors and overall pass rate

A rolling measure of correlation between The Two Checks to overall pass rate confirms the relationship illustrated in Fig 2. – not only is the cause the Document Report Check pass rate (being >0.95 correlated over the period with the declining pass rate), the remaining conditional factor is largely inversely correlated. In other words, the Facial Similarity Check actually improves during the period (close to -1).

The document report check as the cause of a declining overall pass rate warrants closer inspection

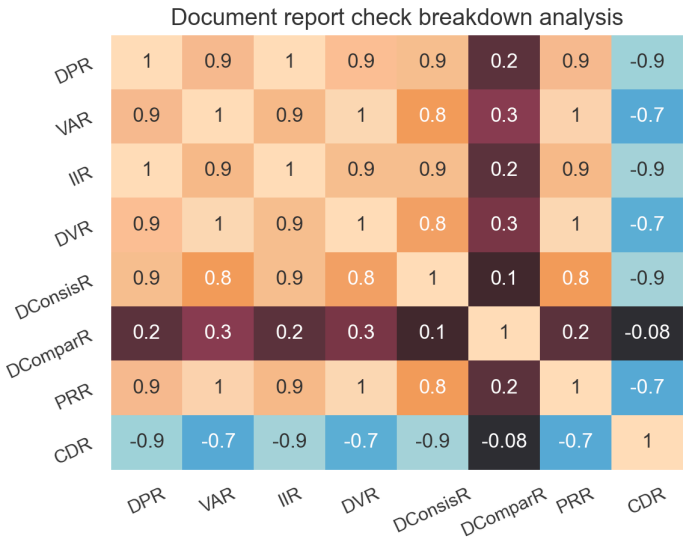

Fig 4. Shows correlation on "clear" results between Document Report Check results and the sub checks

The relationship between the Document Report Check pass rate to corresponding sub-checks that define its pass rates identifies the most likely cause: the Image Integrity Report (IIR), with a correlation to the DRC failure approaching 1.

Fig 5 Veritas API definition of IIR subsequent breakdown checks


```
{
  "image_integrity": {
    "result": "clear",
    "breakdown": {
      "supported_document": {
        "result": "clear",
        "properties": {}
      },
      "image_quality": {
        "result": "clear",
        "properties": {}
      },
      "colour_picture": {
        "result": "clear",
        "properties": {}
      },
      "conclusive_document_quality": {
        "result": "clear",
        "properties": {}
      }
    }
  }
}
```

Data analysis cont.

The root cause of the decline in overall pass rates: the **Conclusive Document Quality Result (CDQR)**

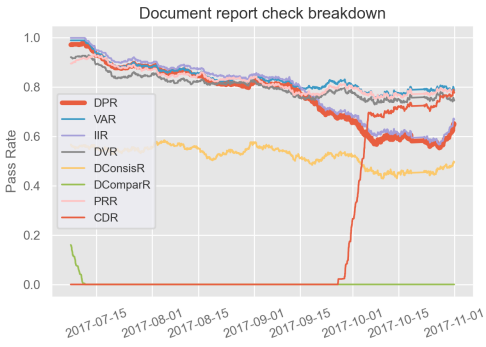

Fig 6. shows pass rates for the Document Report's immediate sub-checks

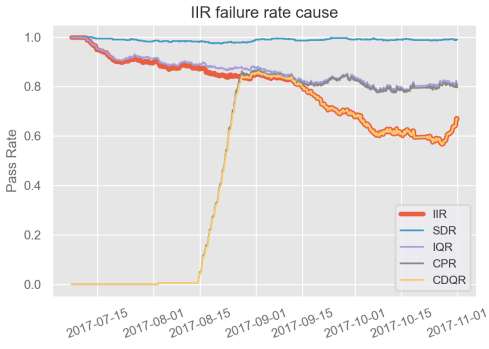

Fig 7. then shows the IIR sub-checks' pass rates over the period

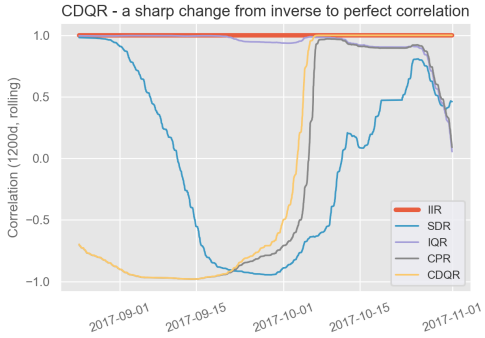

Fig 8. confirms from 6 & 7 the sharp rise of CDQR to perfect correlation with IRR check's pass rates tied to its dependents

Fig 6. confirms further the findings from Fig 4. more concretely: the almost identical relationship between the Image Integrity Result and its dependent the Document Report Check. A time series view of pass rates builds on a measure of correlation over the period; parametric views of the overall period could miss newly established trends and underlying causes to *why* the KYC process pass rates declined most recently, observed from September 2017 specifically.

Building on this, Fig 8 identifies the final and underlying cause to the declining pass rate picture – the CDQR – which only begins returning results from August 2017. This period immediately precedes KYC pass rates beginning their decline. Fig 8 concludes the message using a measure of rolling correlation to illustrate the tightly-coupled relationship and identified cause.

What's behind CDQR as cause for KYC declining in pass rates?

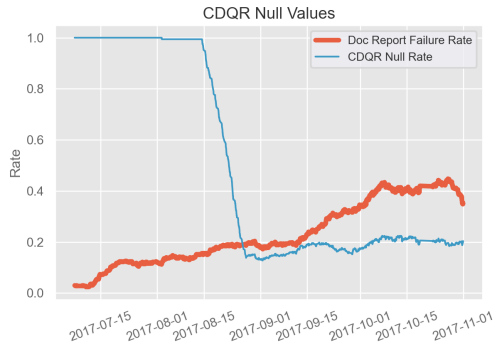

Fig 9

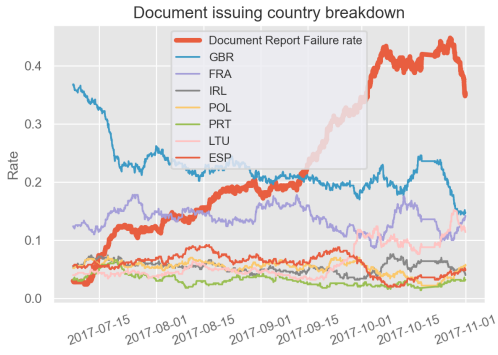

Fig 10

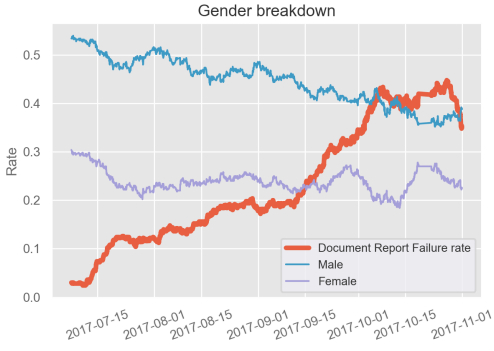

Fig 11

An investigation into the available attributes of documents submitted during the KYC process the CDQR data demands – being a check of the documents themselves – yields no additional insight into an ultimate root cause. Fig 9. first eliminates missing or failed (null) Conclusive Document Quality Results as a contributing factor to declining pass rates; an increasing negative spread from the point KYC pass rates

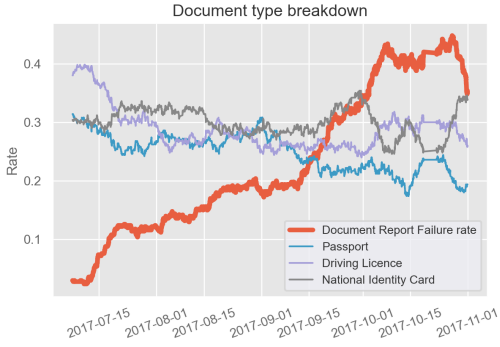

Fig 12

decline more steeply shows no relation between the two data points. And while the CDQRs were completely absent before September (null results), once present it's observed no significant trend to establish causality.

Figs 10 through 12 then examine more closely individual attributes of documents submitted and other remaining data points. No clear trends prevail.

Summary and closing remarks

Revolut is at a critical juncture of its journey. While leveraging the benefits of a hard-won product → market fit and having established operational efficiencies by 3rd party outsourcing to support rapid growth, a bottleneck and potential single-point-of-failure for executing on account applications into organic growth stands to disrupt momentum and inhibit broader market adoption crucial for converting such periods into customer success stories and subsequent sustainable value-generation

Stakeholders would benefit from establishing a practical governance framework helping to objectively review the success of 3rd party partnerships to harden operational activities in pursuit of common objectives (if not already implemented) – at a cadence determined by the business, adjusted by the output of a lean body of relevant KPIs, such as the one in question here: the KYC account opening pass rates dependent to Veritas' checks. Communication channels between teams should exist to identify and escalate emerging problems and deficiencies that underpin faster response times and proper analysis to rectify underlying causes *before* negative consequences can take hold systemically.

The (not so) root cause

- The decline in overall pass rates is caused by the Document Report Check
- This rate of decline caused by the Document Report's IRR checks – specifically the recently-established CDQR check – and accelerates from a period beginning September 2017
- The decline does not appear to be caused by the nature of the applicants or their corresponding documents being examined by the CDQR process

Possible underlying causes

- The Document Report Check relies on both software (OCR et al.) and expert teams to review documents. Either of these resources could be insufficiently adapted to the recent implementation and roll-out of the CDQR process
- The Veritas API could be suffering under increased pressure from the growth in new account applications
- Methodology changes brought about by any changing regulatory conditions

Solutions

- Establish communication and governance channels between Revolut and Veritas operational, technical and business teams to investigate *why* the inclusion of CDQR brought about declining overall pass rates
- Ensure proper customer success teams are live to support any fall-out from undue account opening failures do not lead to prospect-to-customer opportunity costs
- Simplify document submission workflow where possible to help improve resulting document quality for downstream review (CDQR)
- De-risk from a single-point-of-failure for KYC checks to other providers to help ensure a "best-of-breed" solution is delivered in receipt of outsourcing

Limitations

- Small sample size of data available
- Limited information corresponding to significant API changes
- Time..! ☺