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A ROADMAP FOR **GROWTH**

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Approve your declines —

Reject Inference: Are you missing out on profit by declining good customers?





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Introducing:

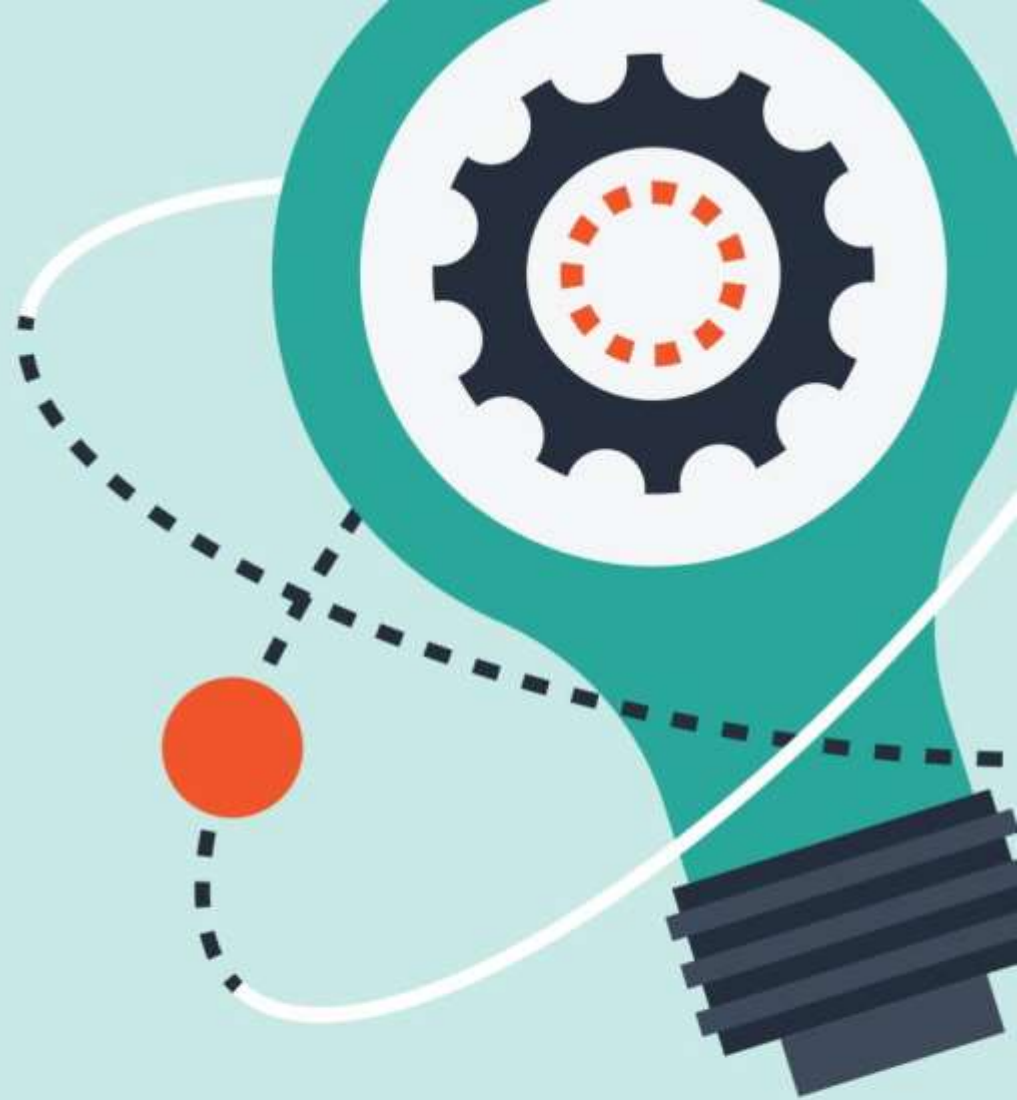
- **Steve Gilligan**
TD Retail Card Services
- **Mike Long**
Experian



Reject Inference

“ Fuzzy logic is a logic whose distinguishing features are logical and fuzzy and not exact. ”

— Professor Lofti A. Zadeh



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Reject inference

Approve your declines

The reject inference classroom!

- Academic theory

The real-world!

- Common real-world approaches
- Client case study – TD Retail Card Services
- Are the bad all bad?

Key take aways

Q&A

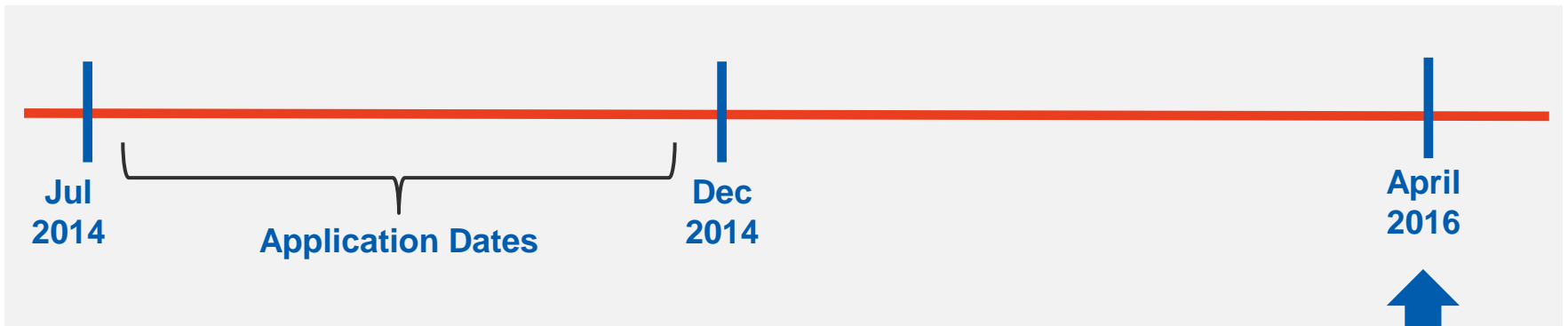


What is reject inference?

Approve your declines

Approved applications

Observation dates (Jul-Dec 2014) ----- Performance date (April 2016)



Performance definitions

Bad

Consumers who are 90+ days past due, charged off or bankrupt during the performance period

Good

Consumers who are between 0 and 89 days past due, not charged off and not bankrupt during the performance period

Known performance

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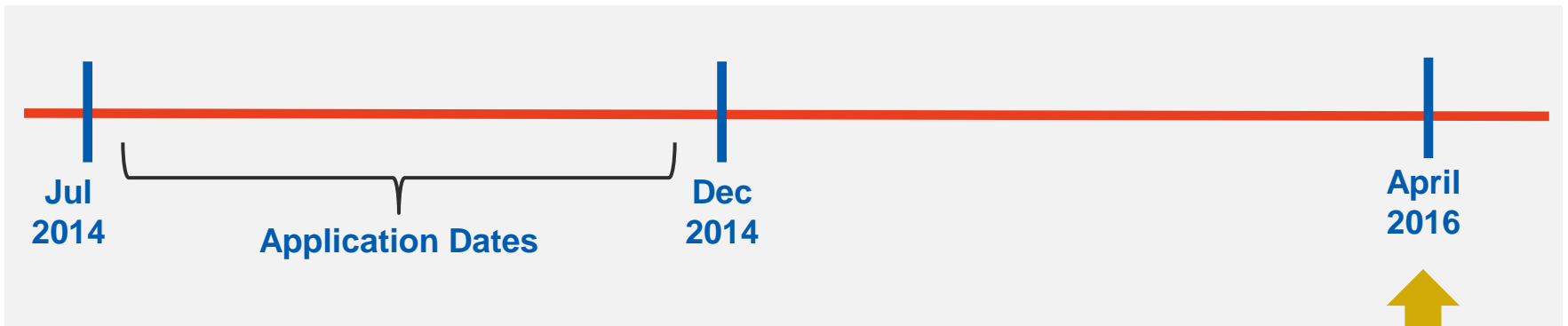


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The reject inference classroom

“ Education is what remains after one has forgotten everything they learned in school. ”

— Albert Einstein



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Academic theory

Approve your declines



Manual estimation

- Otherwise known as “expert rules”
- Use pre-existing knowledge to simulate performance of the declined population

Re-weighting

- Apply full accept performance distribution by score

Augmentation

- Family of methods used to “cluster” similar approved and declined applications together
- Data mining (e.g., logistic regression, CHAID, neural networks, etc.)

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Academic theory

Approve your declines

- Reclassification
- Parceling
- Heckman's bias correction
- Monte Carlo parceling
- Etc.

**Use known
performance of
your approvals**

**To guesstimate
what would
have happened
to your declines**





Common real-world approaches

Approve your declines



Sampling

- Accept some of the 'better' declines

Champion challenge

- Compare swap in populations



Common real-world approaches

Approve your declines

Supplementary bureau inference data

- How did the declined population perform elsewhere?
- Tradeline level data
- Consumer level data
- Opened date
- Worst performance in past 24 months, 18 months, etc.
- Spend
- Estimated Interest Rate Calculator (EIRCSM)



Client case study – TD Retail Card Services

“ JK Rowling’s first Harry Potter was rejected 12 times. Stephen King’s, Carrie; 30 times. Gone with the Wind; 38 times. I beat them all.”

— Ashwin Sanghi, Novelist



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Powers of inferred populations



View you are trying to disprove

- Many lenders make the assumptions that booked populations always out perform any segment of the total population (approved, approved not booked and declined)
- View is we know our customers best, have the best policy and best price
- Other lender's models are inferior to ours
- Other lender's process not as good as ours
- We know the market the best



Powers of inferred populations



Reality is that is not the case

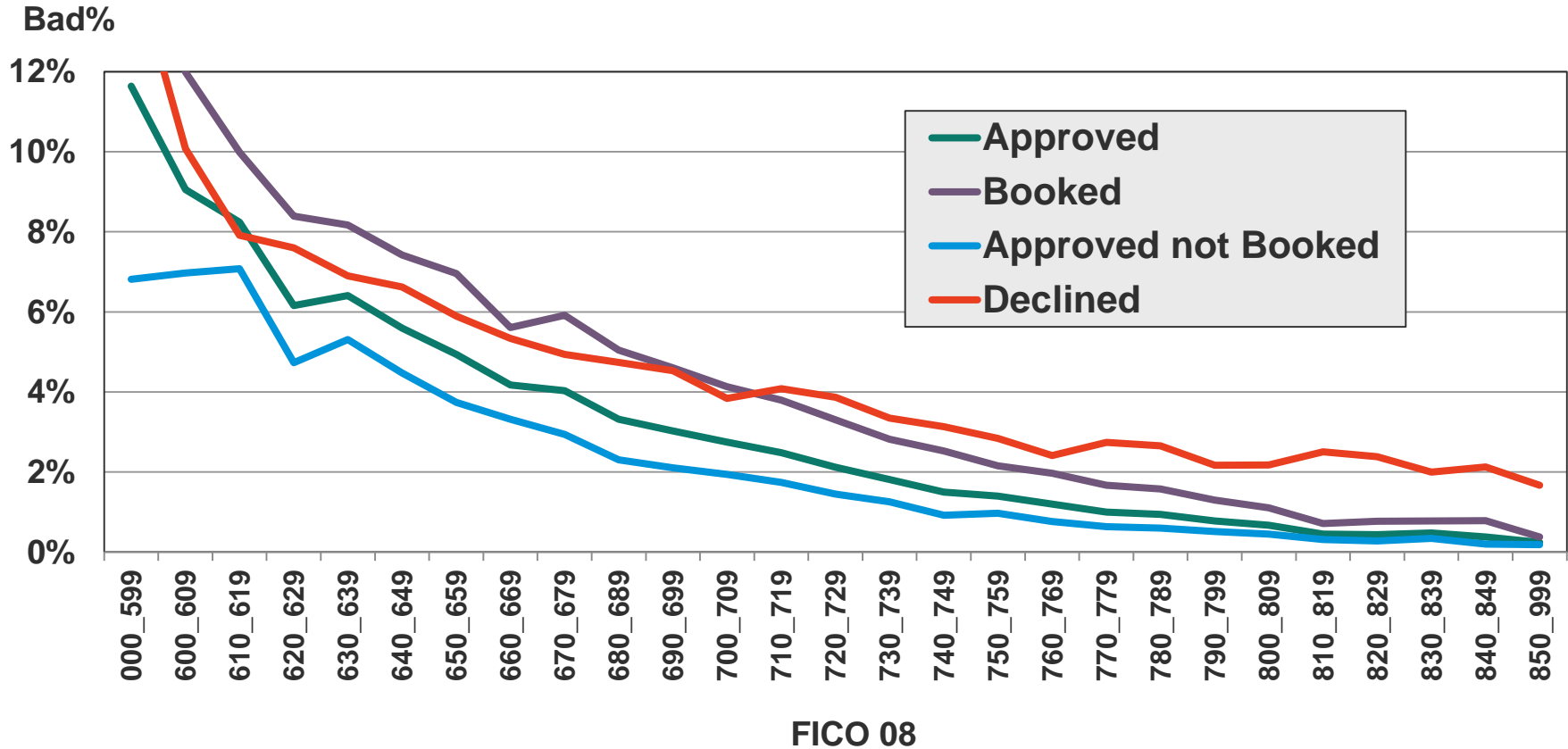
- Inferred population can bring enlightenment into your credit adjudication process
- Your assumptions may not be true about performance
- Your credit policy may not have evolved as fast other lender's
- Market may have shifted
- Product offerings may be stall
- Adverse selection does occur
- Adverse selection could be in the riskiest segment



Inferred population lends insight



Bad % compare (FICO 08) 2Q-2011 – 1Q-2012



**Bad Definition: accounts were 60 days past due or worse within the performance window of 18 months from origination.

**Indetermined performance and missing fico applications are excluded.



Model development and performance time periods

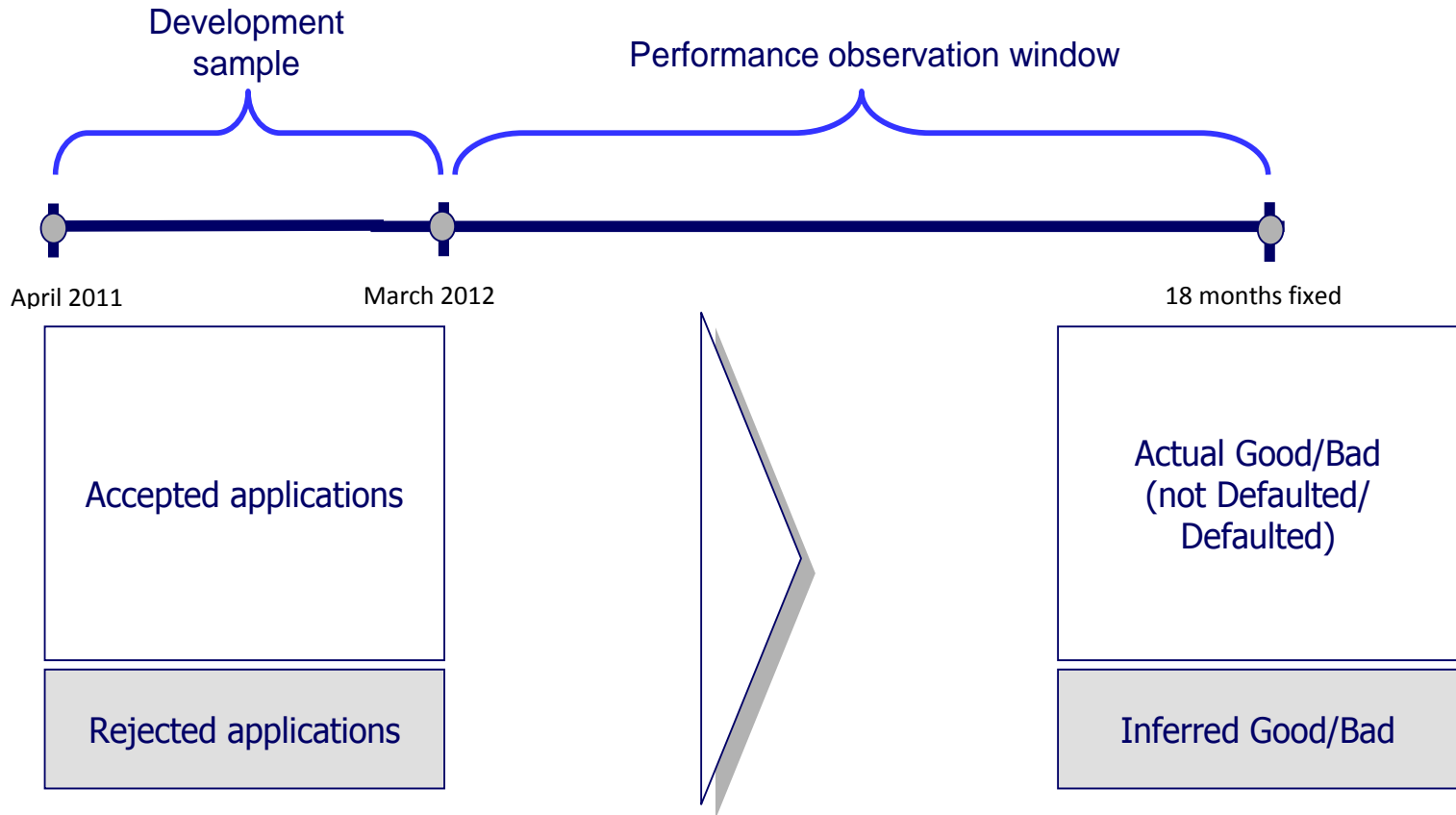


Model development used booked and inferred records

- TDAF booked data was shared with Experian, with performance appended
- TransUnion conducted bureau inferencing on the non-TDAF booked records, identified proxy tradelines, and captured performance
 - ▶ The proxy tradelines that TransUnion captured and calculated performance represented new auto tradelines that opened within 60 days of application with TDAF
- Used 18-month fixed performance window for model development
- Inferred performance was weighted so that it represented 30% of the bad population to prevent model being developed on inferred population



Model development and performance time periods



Are the bad all bad?

“ The best people are always the worst. ”

— Criss Jami, Philosopher



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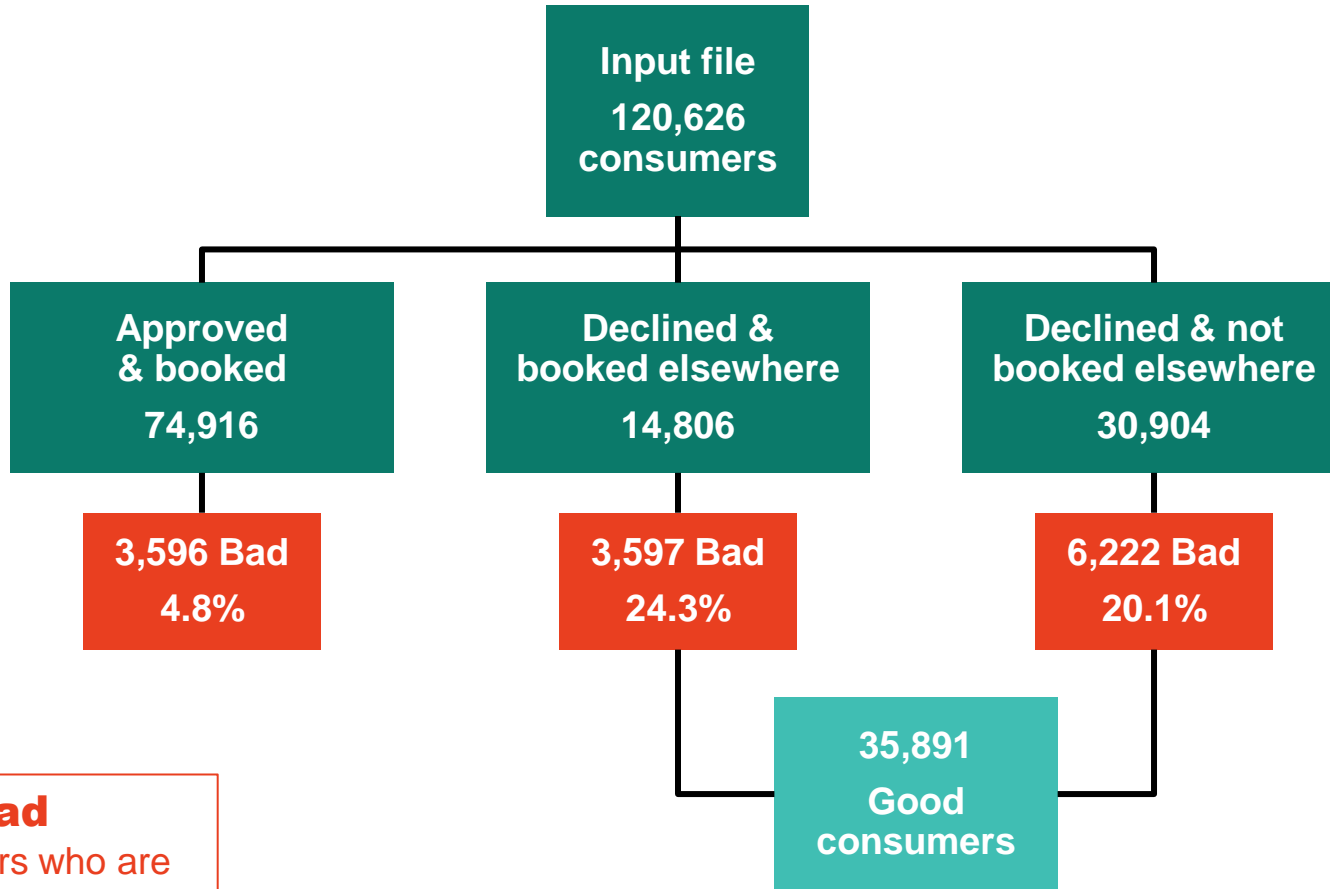
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Are the bad all bad? – Data overview

Approve your declines



Bad
Consumers who are
90+ days past due,
charged off or bankrupt



Are the bad all bad? – Consumer profiling

Using Experian scoring models: Approve your declines

VantageScore® 3.0

Credit score model. Predicts the likelihood that a consumer will go delinquent (90+ DPD) in the next 24 months

Score range 300-850: Super Prime 751-850; Prime 661-780; Near Prime 601-660; Sub-Prime 500-600; Deep Sub-Prime 300-499

Total Annual Plastic Spend (Experian TAPSSM)

Total dollar spend on charge / bank cards in most recent 12 months

Asset Insight®

Estimation of a consumer's liquid assets. Score range 1 – 999

A score of 999 means that the consumer is likely to have more liquid assets than 99.9% of the population

Income Insight W2SM

Model predicting dollar amount of salaried income rounded to the nearest thousand

Output range \$1K to \$999K



Are the bad all bad? – Consumer profiling

Using Experian scoring models: Approve your declines

Score model	Score averages				
	All consumers	Approved	Declined / booked elsewhere	Declined / not booked elsewhere	
VantageScore® 3.0	688	751	588	578	Declined applicants have a significantly worse credit profile
Total Annual Plastic Spend (Experian TAPS SM)	\$20,106	\$25,163	\$9,917	\$9,844	
Asset Insight®	449	612	186	171	
Income Insight W2 SM	\$51,745	\$57,883	\$42,203	\$40,954	

More likely to default

Use a lot less plastic

Hold less liquid assets

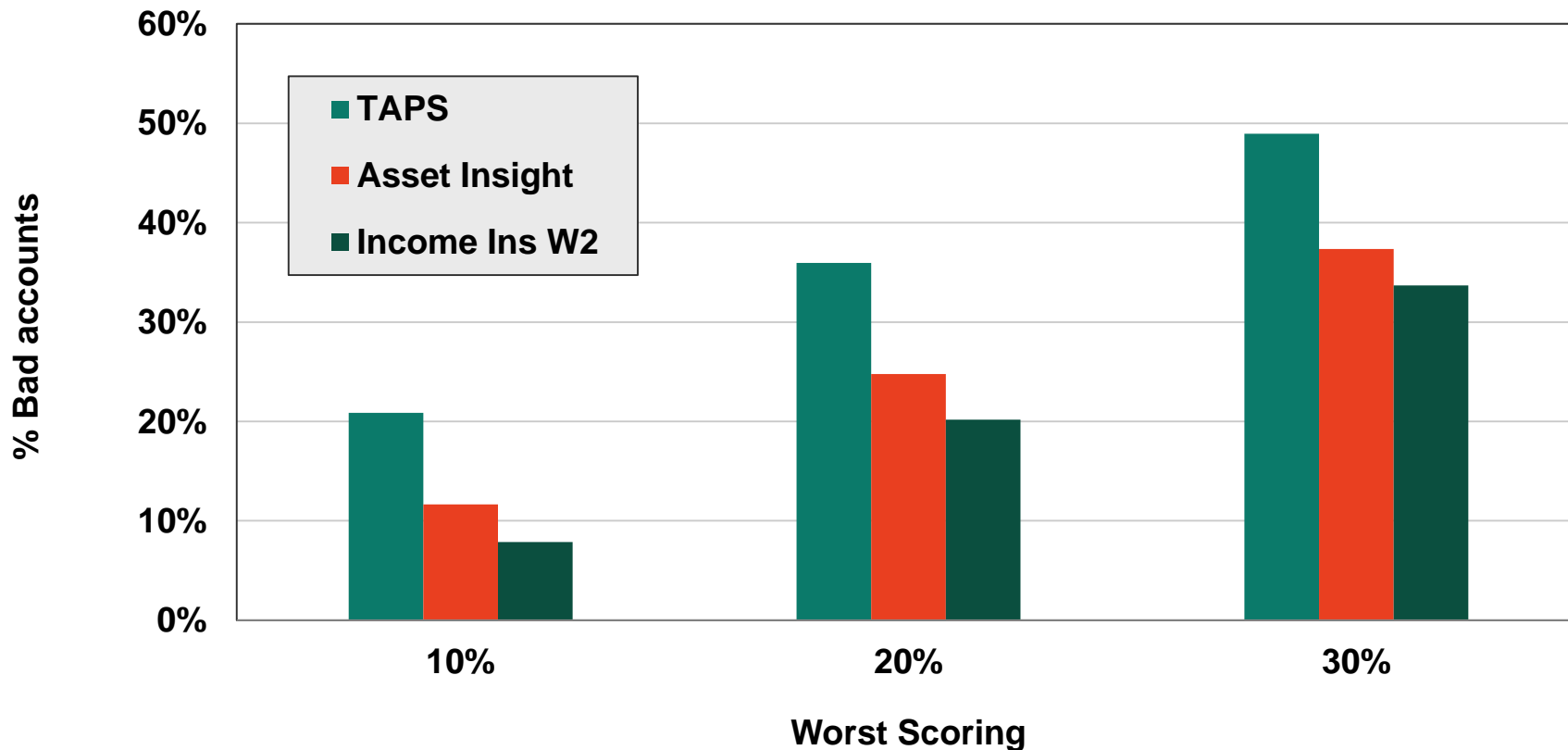
Have a lower salary



Picking the good from the bad

Approve your declines

Percent of bads captured for the worst scoring consumers



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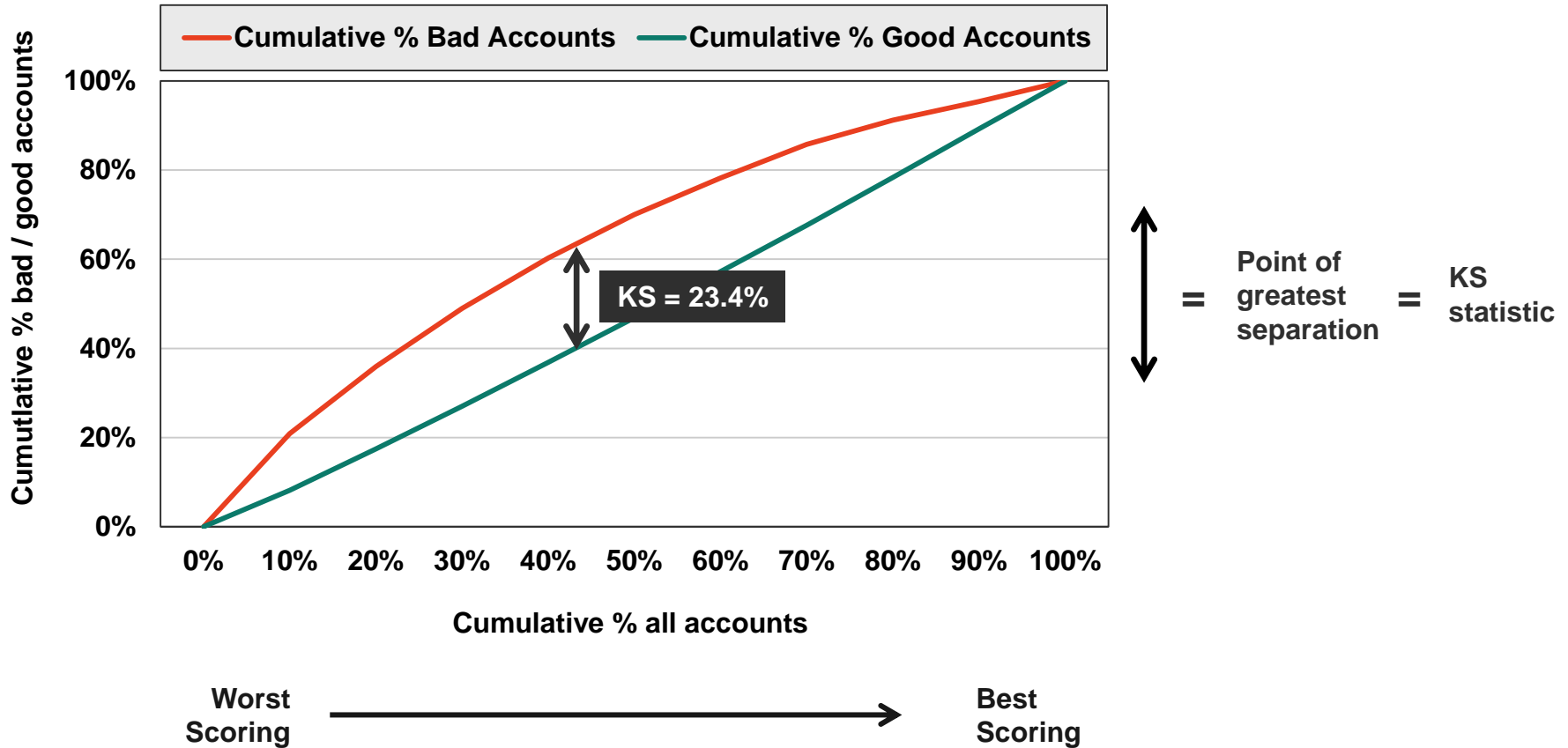
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Picking the good from the bad

Approve your declines

Kolmogorov-Smirnov (KS) statistics

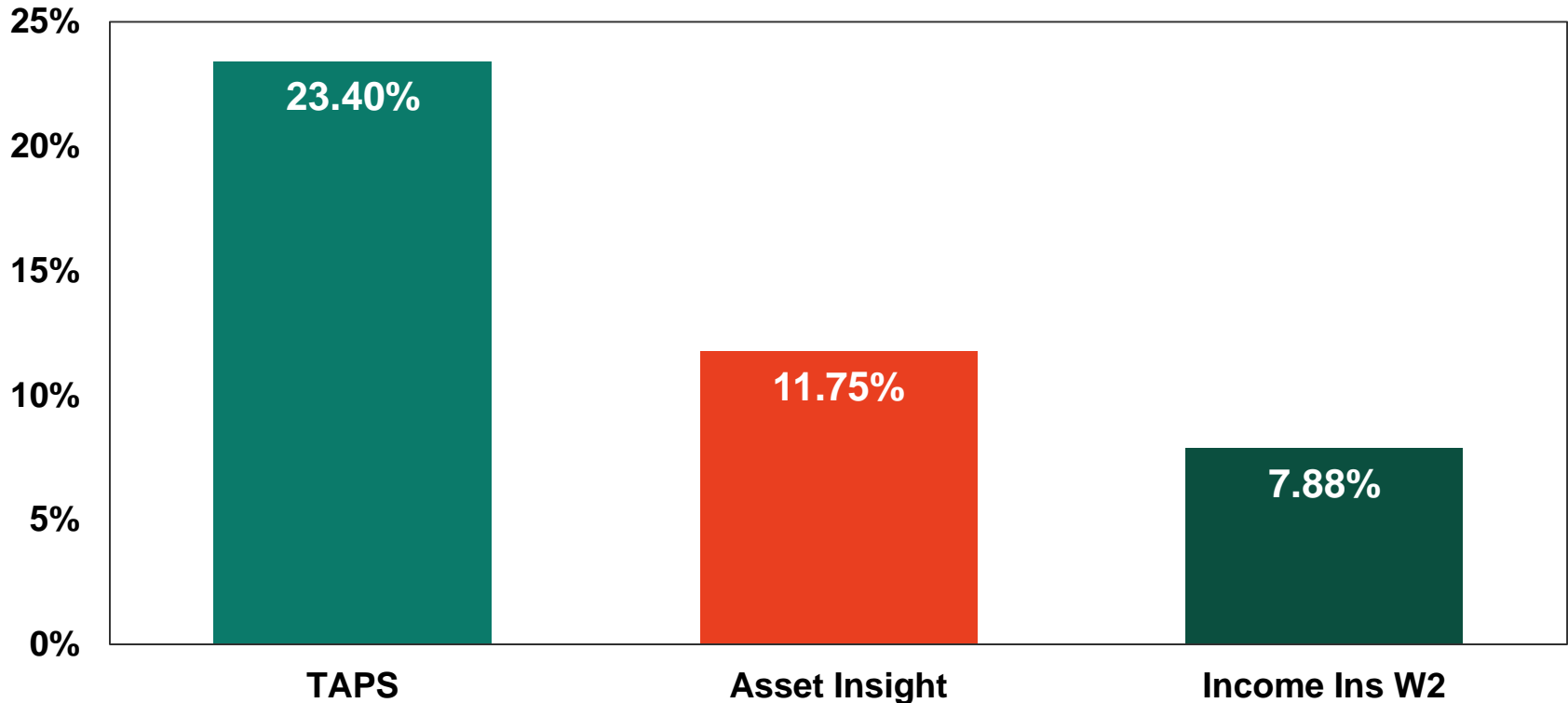




Picking the good from the bad

Approve your declines

Kolmogorov-Smirnov (KS) statistics

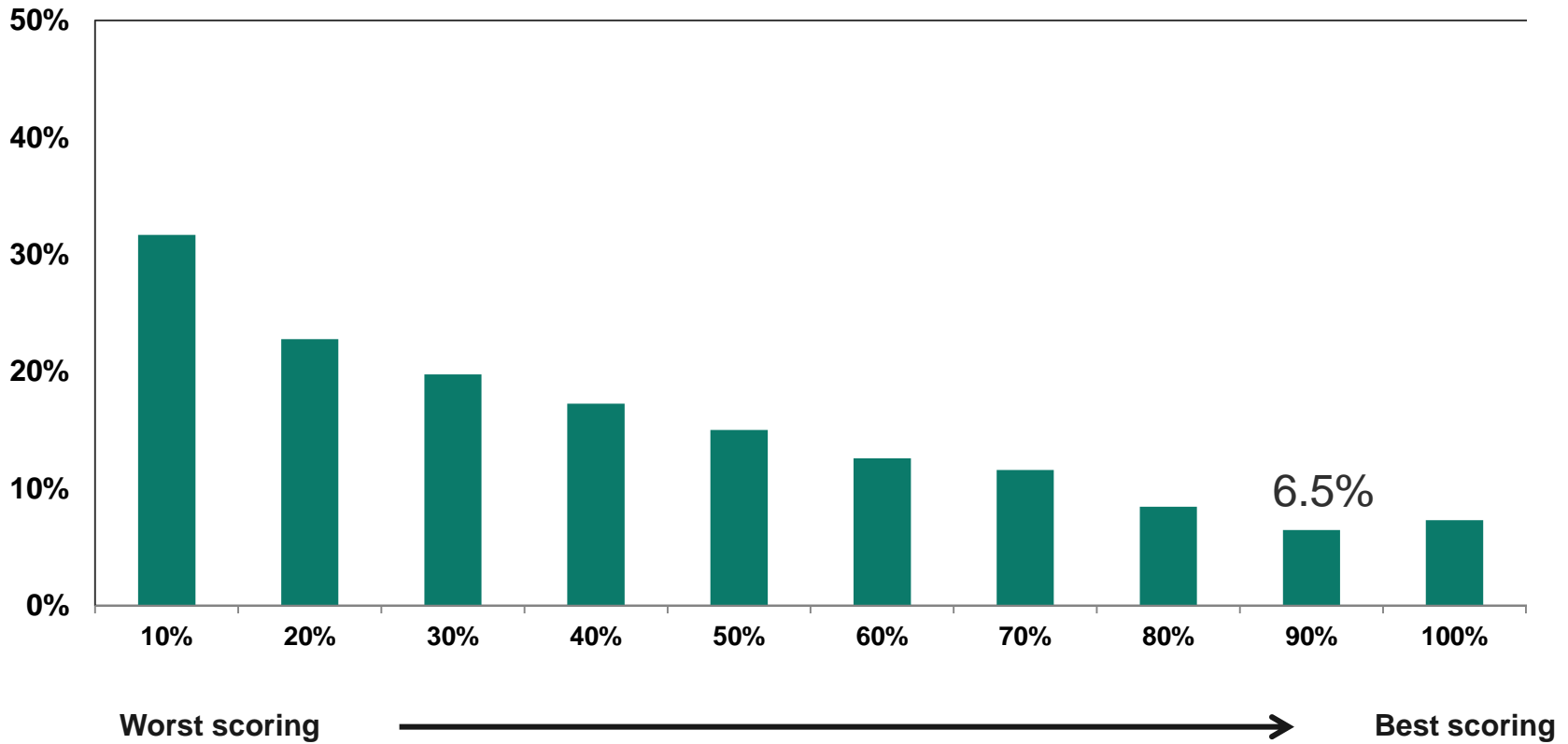




Picking the good from the bad

Approve your declines

Experian TAPSSM – % bad within each score interval





Picking the good from the bad

Approve your declines

Combine VantageScore® 3.0 with Experian TAPSSM % bad within each score interval

Bad Rate % :

		TAPS											EXCLUSION	Total
		Worst 10%	20%	30%	40%	50%	60%	70%	80%	90%	Best 100%			
VantageScore 3.0	Worst 10%	39.0%	29.3%	29.1%	19.9%	25.7%	18.1%	28.8%	18.3%	18.8%	31.1%	43.7%	34.4%	
	20%	31.5%	24.6%	23.3%	20.1%	22.1%	18.0%	15.7%	15.8%	15.8%	16.5%	42.0%	29.3%	
	30%	35.7%	23.4%	18.6%	18.1%	17.6%	15.8%	14.2%	10.1%	13.2%	16.7%	48.5%	27.6%	
	40%	35.6%	26.3%	22.6%	21.6%	18.1%	14.8%	16.8%	9.5%	9.6%	10.6%	46.0%	25.5%	
	50%	39.7%	22.4%	19.5%	18.6%	15.4%	12.0%	12.5%	13.2%	8.6%	9.8%	47.8%	23.4%	
	60%	29.3%	25.1%	19.2%	17.8%	14.1%	14.7%	9.7%	8.8%	7.8%	7.9%	45.5%	19.8%	
	70%	27.8%	19.4%	15.6%	19.4%	13.0%	11.2%	10.5%	7.2%	4.1%	5.7%	50.3%	16.7%	
	80%	26.9%	18.6%	20.1%	18.5%	12.9%	10.4%	10.1%	7.2%	3.8%	5.5%	48.7%	15.6%	
	90%	30.5%	17.7%	17.5%	11.1%	8.9%	9.6%	8.2%	6.5%	5.0%	4.8%	52.6%	14.5%	
	Best 100%	23.1%	17.4%	11.5%	9.2%	9.2%	8.1%	6.5%	3.9%	3.5%	5.1%	44.7%	10.6%	
EXCLUSION	16.4%	10.7%	8.9%	3.1%	5.0%	5.1%	5.1%	1.3%	4.9%	0.0%	46.2%	15.7%		
Total	31.7%	22.7%	19.7%	17.3%	15.0%	12.6%	11.6%	8.4%	6.5%	7.3%	45.9%	21.5%		

Key :

Below 5%
Below 15%
Above 25%
Above 30%

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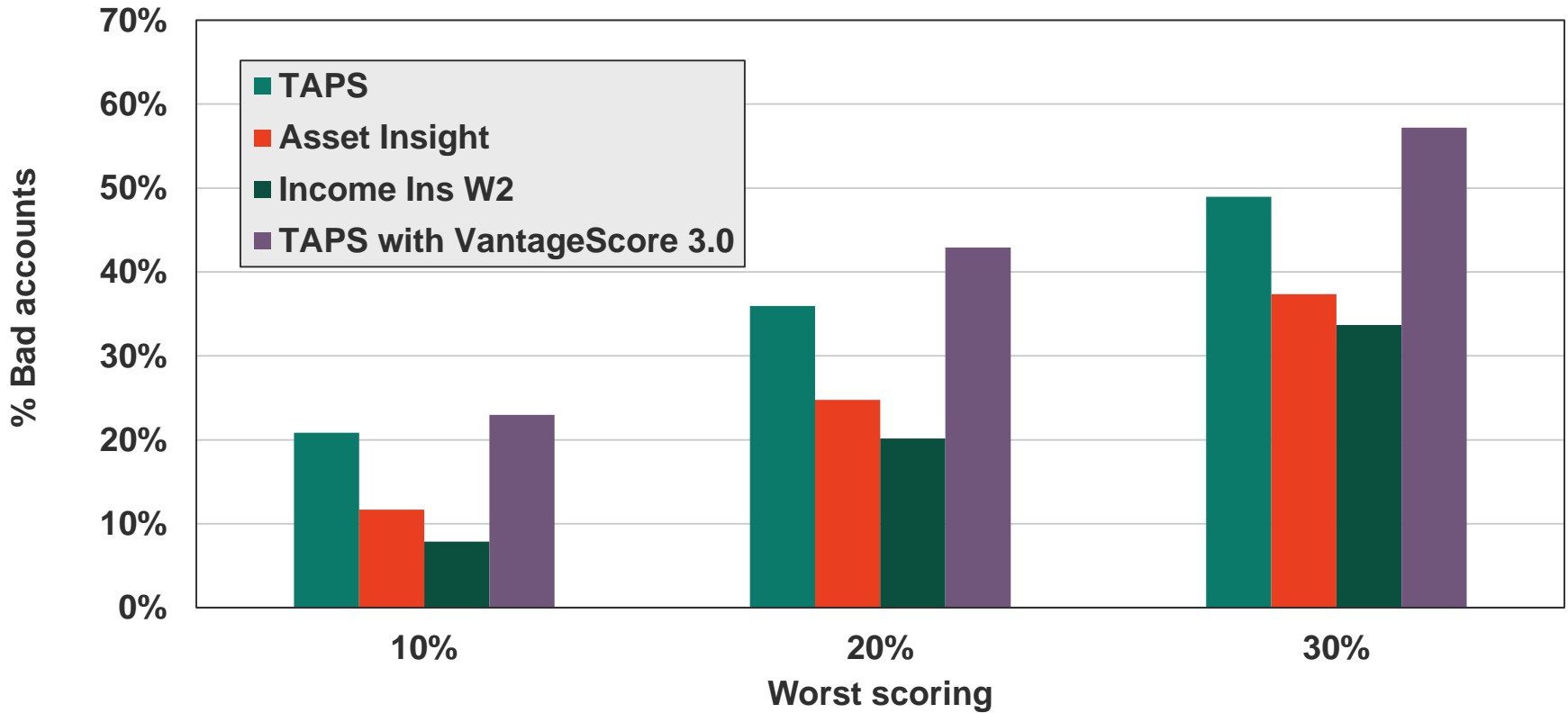
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Picking the good from the bad

Approve your declines

Percent of bads captured for the worst scoring consumers

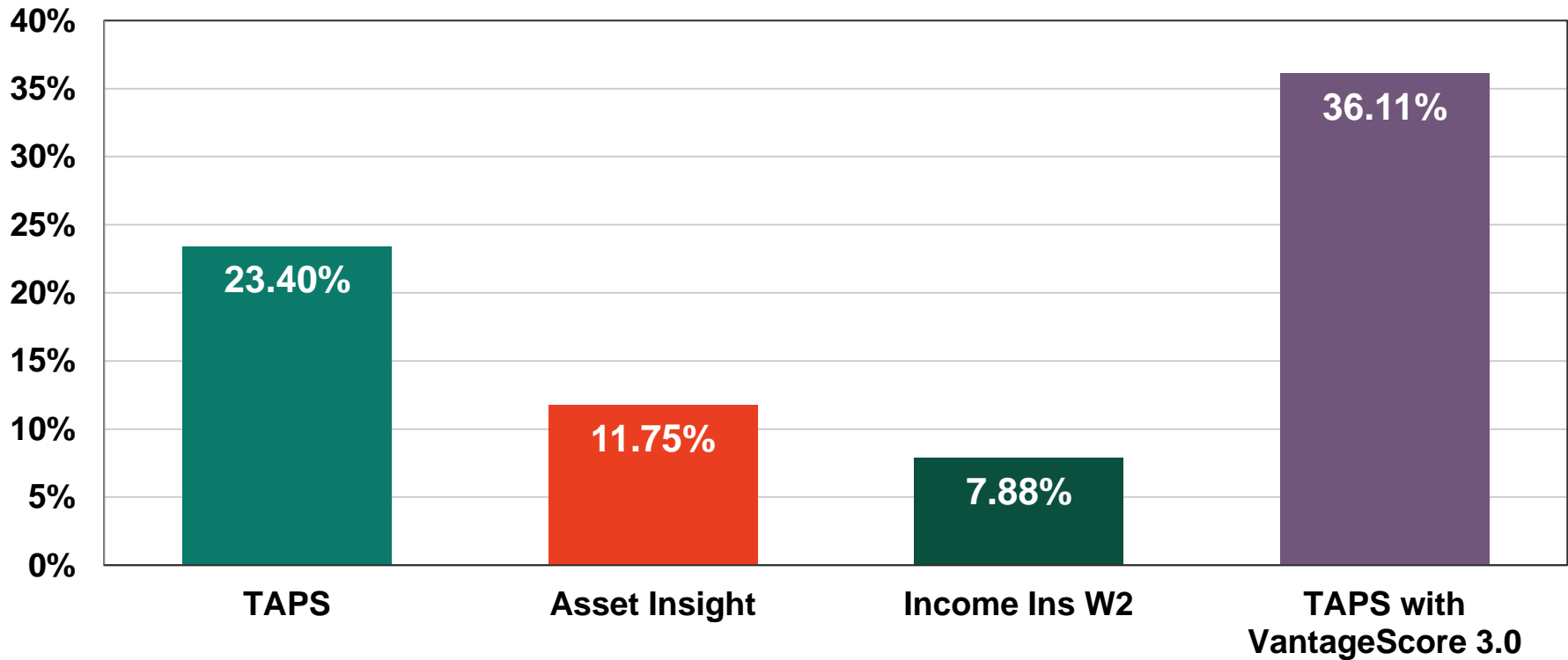




Picking the good from the bad

Approve your declines

Kolmogorov-Smirnov (KS) statistics



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Are the bad all bad?

Approve your declines

Is there a declined population with a bad rate of 4.8%?

Bad Rate % :

		TAPS											EXCLUSION	Total
		Worst 10%	20%	30%	40%	50%	60%	70%	80%	90%	Best 100%			
VantageScore 3.0	Worst 10%	39.0%	29.3%	29.1%	19.9%	25.7%	18.1%	28.8%	18.3%	18.8%	31.1%	43.7%	34.4%	
	20%	31.5%	24.6%	23.3%	20.1%	22.1%	18.0%	15.7%	15.8%	15.8%	16.5%	42.0%	29.3%	
	30%	35.7%	23.4%	18.6%	18.1%	17.6%	15.8%	14.2%	10.1%	13.2%	16.7%	48.5%	27.6%	
	40%	35.6%	26.3%	22.6%	21.6%	18.1%	14.8%	16.8%	9.5%	9.6%	10.6%	46.0%	25.5%	
	50%	39.7%	22.4%	19.5%	18.6%	15.4%	12.0%	12.5%	13.2%	8.6%	9.8%	47.8%	23.4%	
	60%	29.3%	25.1%	19.2%	17.8%	14.1%	14.7%	9.7%	8.8%	7.8%	7.9%	45.5%	19.8%	
	70%	27.8%	19.4%	15.6%	19.4%	13.0%	11.2%	10.5%	7.2%	4.1%	5.7%	50.3%	16.7%	
	80%	26.9%	18.6%	20.1%	18.5%	12.9%	10.4%	10.1%	7.2%	3.8%	5.5%	48.7%	15.6%	
	90%	30.5%	17.7%	17.5%	11.1%	8.9%	9.6%	8.2%	6.5%	5.0%	4.8%	52.6%	14.5%	
	Best 100%	23.1%	17.4%	11.5%	9.2%	9.2%	8.1%	6.5%	3.9%	3.5%	5.1%	44.7%	10.6%	
EXCLUSION		16.4%	10.7%	8.9%	3.1%	5.0%	5.1%	5.1%	1.3%	4.9%	0.0%	46.2%	15.7%	
Total		31.7%	22.7%	19.7%	17.3%	15.0%	12.6%	11.6%	8.4%	6.5%	7.3%	45.9%	21.5%	

This population contains 6,628 declined consumers

- 6,310 good consumers (18% of the 35K)
 - ▶ At a bad rate of 4.8%

Reduce declines by nearly 20%!!

Key take aways

“ Only those who risk going too far
can possibly find out how far one can go. ”

— T.S. Eliot



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Reject inference

Approve your declines

- Multiple academic methodologies
 - ▶ Using approval performance to guesstimate bad performance
- Real-world approaches – sampling and supplemental bureau data
- The bad are not all bad
 - ▶ Bureau scores help pick the good declines from the bad
 - ▶ Combining scores provides greater differentiation

Reject inference

- Increases approval rates
- Increases profits
- Is essential to keep yourself ahead



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Q&A





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**For additional information,
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Michael.Long@experian.com

<https://www.linkedin.com/in/michael-long-4a378b42/>



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Experian

1. How would you rate the presenters' knowledge?
 Excellent Above average Average Below average Poor

2. How would you rate the presenters' delivery?
 Excellent Above average Average Below average Poor

3. How would you rate the presenters' time management?
 Excellent Above average Average Below average Poor

4. How useful was the session information?
 Very useful Somewhat useful Neutral
 Somewhat not useful Not useful

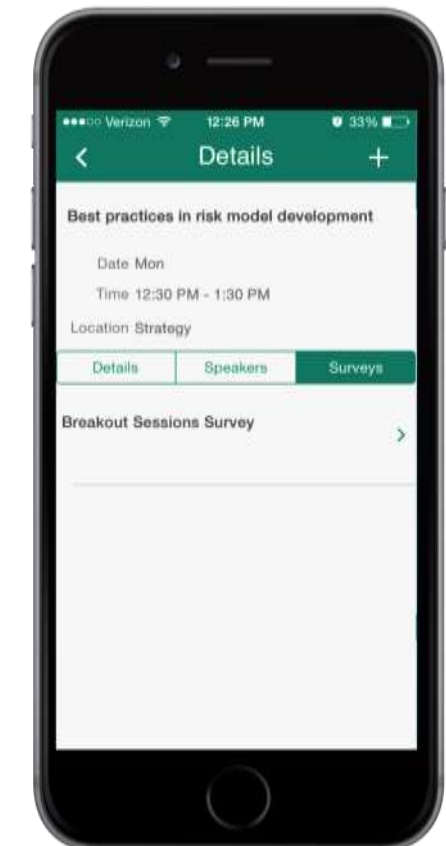
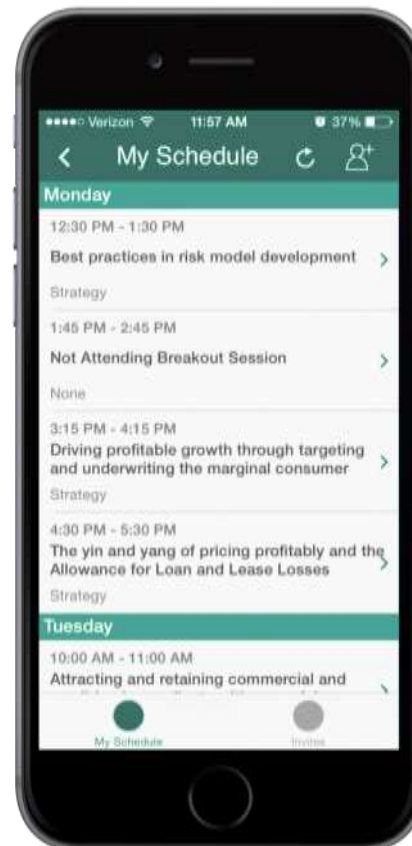
5. How would you rate the session on being current?
 Very current Somewhat current Neutral
 Somewhat not current Not current

6. How relevant was the session content to the title and description?
 Very relevant Somewhat relevant Neutral
 Somewhat not relevant Not relevant

7. How would you rate the level of content?
 Too advanced Just right Too basic

8. Why did you attend this session? (Check all that apply)
 Relates to my business The presenter(s) Interest in new product
 Compelling session description Increase product knowledge

9. Do you have any additional comments?





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