CphMRA Meeting

AI:EV – Predicting Policy Impact

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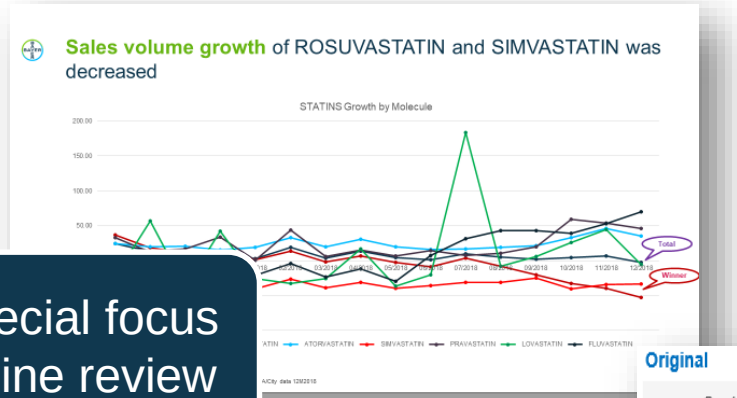
October 25, 2019

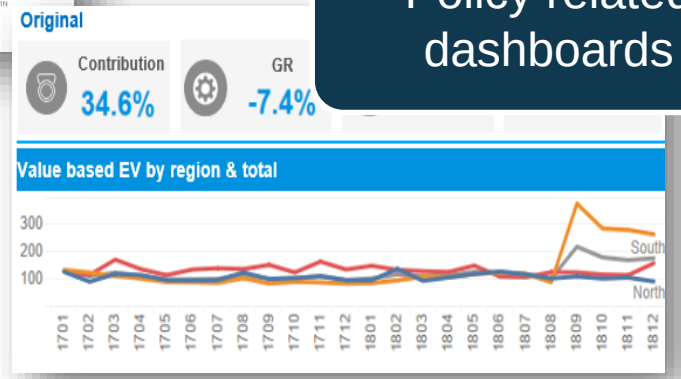
Policy changes impacting our sales & market dynamics

Stakeholders from multiple departments

Multiple analysis approaches to analyze policy impact on market



Special focus offline review



Policy related dashboards

Common dashboards (Market insight, Internal sales)

Other external sources

… all looking backwards

AI:EV prestudy – Try to look into the future

Use advanced analytics to ***predict*** market, key product ***sales volume & market share*** *for* upcoming next 1 month, next 6 and 12 months in large hospital market.

* Prediction based on IQVIA data, large hospital (>100 bed) market

Methodology

Feature scoping

38 Factors defined by team

600+ Features included

Volume_	Volume_	Volume_	Volume_	Volume_	Volume_	Volume_	Volume_	Volume_	Volume_
18720	20160	17280		20160		10656	7776	16416	14400	20160
18720	20160	17280		20160		10656	7776	16416	14400	20160
04682	992068	852852		1105286	1160964	1340990	1216320	1122730
04682	99	52		1105286	1160964	1340990	1216320	1122730
55610	25			276150	304130	343500	365100	318470	311660
55610	25	25		276150	304130	343500	365100	318470	311660
66730	62	66		73170	82210	77610	92910	75850	76860
66	628	662	604	79600	73170	82210	77610	92910	75850	76860
526	210			226093	225708	237832	234360	297500	269808	268184
3926	1									
327	9									
	285									
03656	7715									
03656	771946	714854	728147	852075	898562	1104845	1169371	1422673	1315412	1329699
94260	399390	396330	368094	377892	393426	392208	397650	431160	398856	370266
94260	399390	396330	368094	377892	393426	392208	397650	431160	398856	370266
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
20208	894446	750302	686448	705838	729344	843122	738794	882728	699986	658882
20208	894446	750302	686448	705838	729344	843122	738794	882728	699986	658882
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
39580	2146860	2228350	2040710	2198650	2055020	2315410	2293900	2614450	2206080	2055640
39580	2146860	2228350	2040710	2198650	2055020	2315410	2293900	2614450	2206080	2055640
68970	176760	205670	175160	201060	171260	210920	183020	191440	153010	172000
68970	176760	205670	175160	201060	171260	210920	183020	191440	153010	172000
01530	163758	162225	135457	206206	170975	180684	171948	256046	287364	340592

e.g. policy trend, market share, market size, statistical result, sales volume lag, and the product information

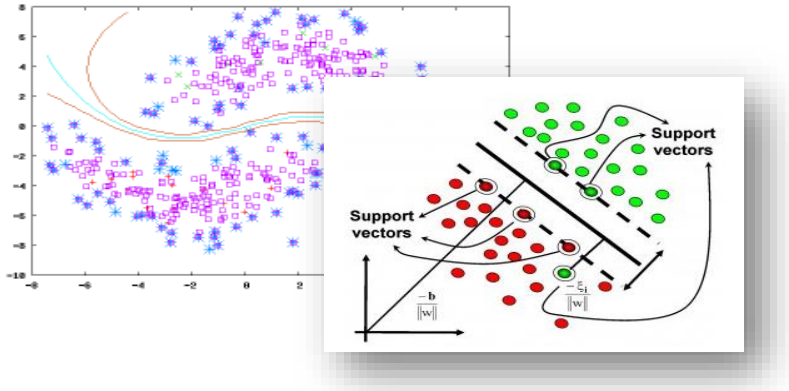
AI:EV prestudy

Supervised learning model applied for

~12,000 pack-city combinations, 300+ companies, 500+ products

41 cities

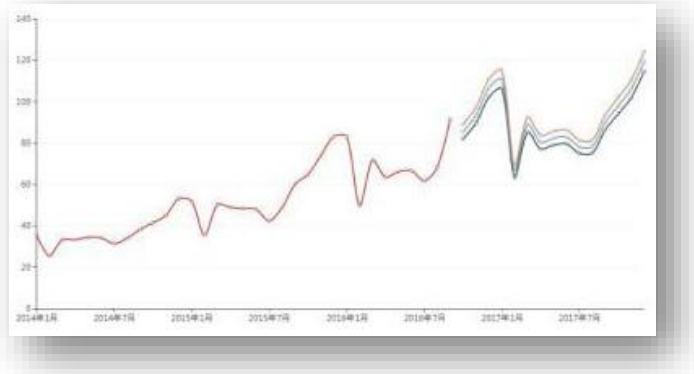
Classify / Clustering



1. Split test data: key product/ or not, policy city/ not → select a feature set for each groups.

2. Classifier: Train a classifier model to predict will have sales volume or not.

Predicting



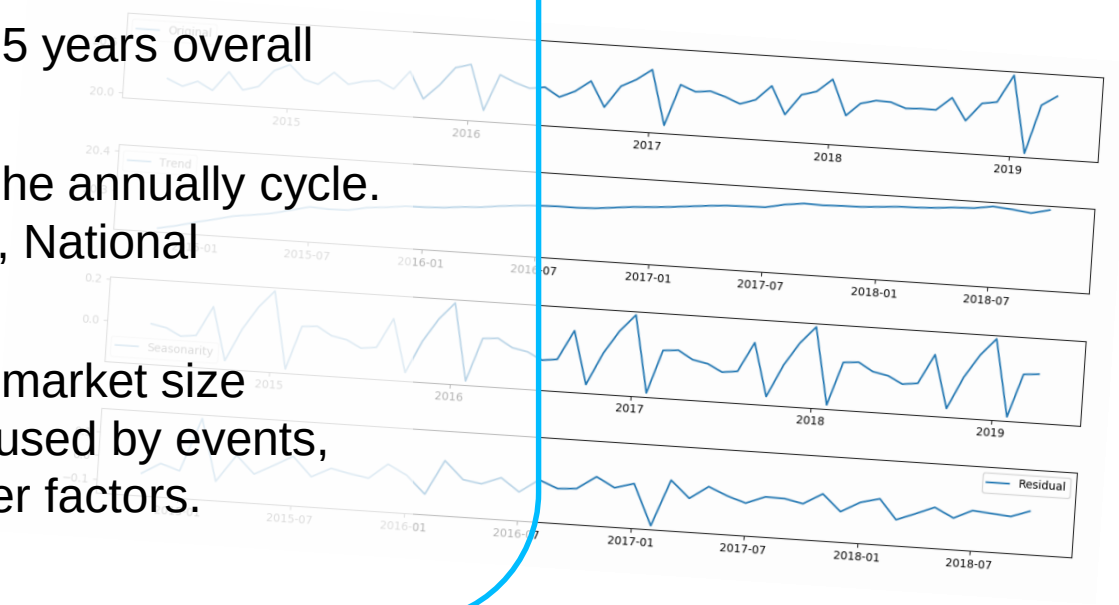
Gradient Boosting Regressor as main model to predict the next six months sales volume.

Model Amendment – Next month ☺

Market Size Predictor

ARIMA model:

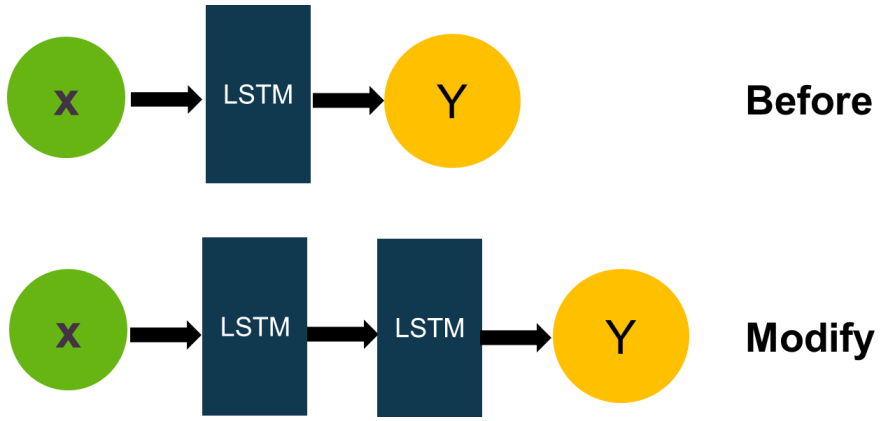
1. ***Overall trend***: 5 years overall trend
2. ***Seasonality***: The annually cycle. (Spring festival, National festival...)
3. **Residual**: The market size change that caused by events, policies, or other factors.



Model Amendment – 3 months after creation

Prediction period expansion

Increase level of LSTM:



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+ in-mkt. features

+ group further and train specifically

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Current feature set

6 months prediction

volume_last_month_4	MKTNRDLSHORTDESC
volume_last_month_3	MKTGQCESHORTDESC
volume_last_month_2	Type
volume_last_month_1	IsKeyProduct
YTD_Volume_last_month_4	IsKeyCompetitor
YTD_Volume_last_month_3	CityTier
YTD_Volume_last_month_2	Originator
YTD_Volume_last_month_1	winner_flag
is_zero_last_month_4	4+7CityMar2019
is_zero_last_month_3	CompsDesc_company_count
is_zero_last_month_2	CompsDesc_product_count
is_zero_last_month_1	marketshare_last_month_4
MAT_Volume_last_month_1	marketshare_last_month_3
LYRQ_Volume_last_month_1	marketshare_last_month_2
LYFY_Volume_last_month_1	marketshare_last_month_1
LYMAT_Volume_last_month_1	policy_scope
LYYTD_Volume_last_month_1	predict_is_zero

Factors selected by machine

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6-12 months prediction

ln market sales	LM CM comp
volume	LY CM volum
month gap to new year	LY CM volum
month gap to national day	LY CM total
month	LY CM compe
marketshare	LYNM volume
LY volume	LYNM market
LY marketshare	LYNM LY volu
LM CM sales DIFF	LYNM LY mar
LM CM marketshare DIFF	LYNM LY con
LM CM total marketsize DIFF	LYNM LY tota

ln market sales	LM CM competitor marketsize DIFF
volume	LY CM volume DIFF
month gap to new year	LY CM volume DIFF
month gap to national day	LY CM total marketsize DIFF
month	LY CM competitor marketsize DIFF
marketshare	LYNM volume
LY volume	LYNM marketshare
LY marketshare	LYNM LY volume DIFF
LM CM sales DIFF	LYNM LY marketshare DIFF
LM CM marketshare DIFF	LYNM LY competitor marketsize DIFF
LM CM total marketsize DIFF	LYNM LY total marketsize DIFF

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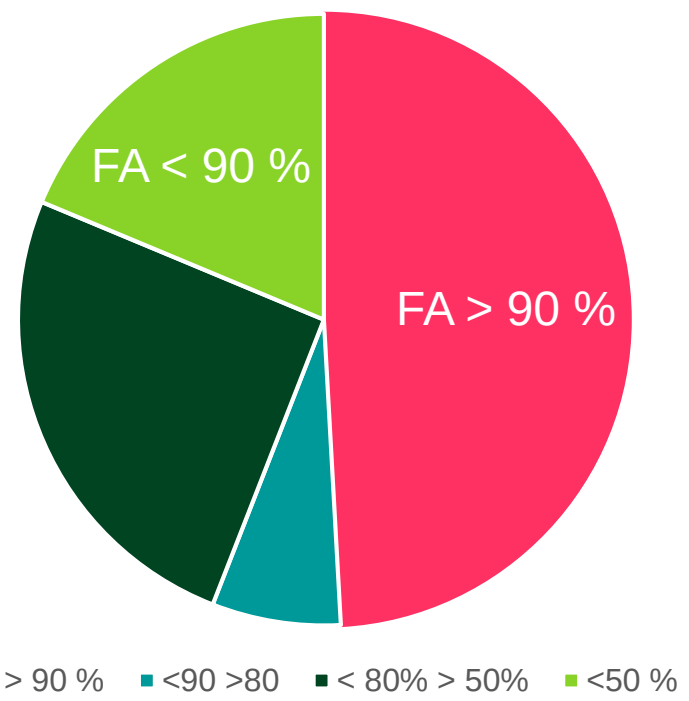
Results

Pack-level forecast accuracy overview

~12,000 pack-city combinations

41 cities

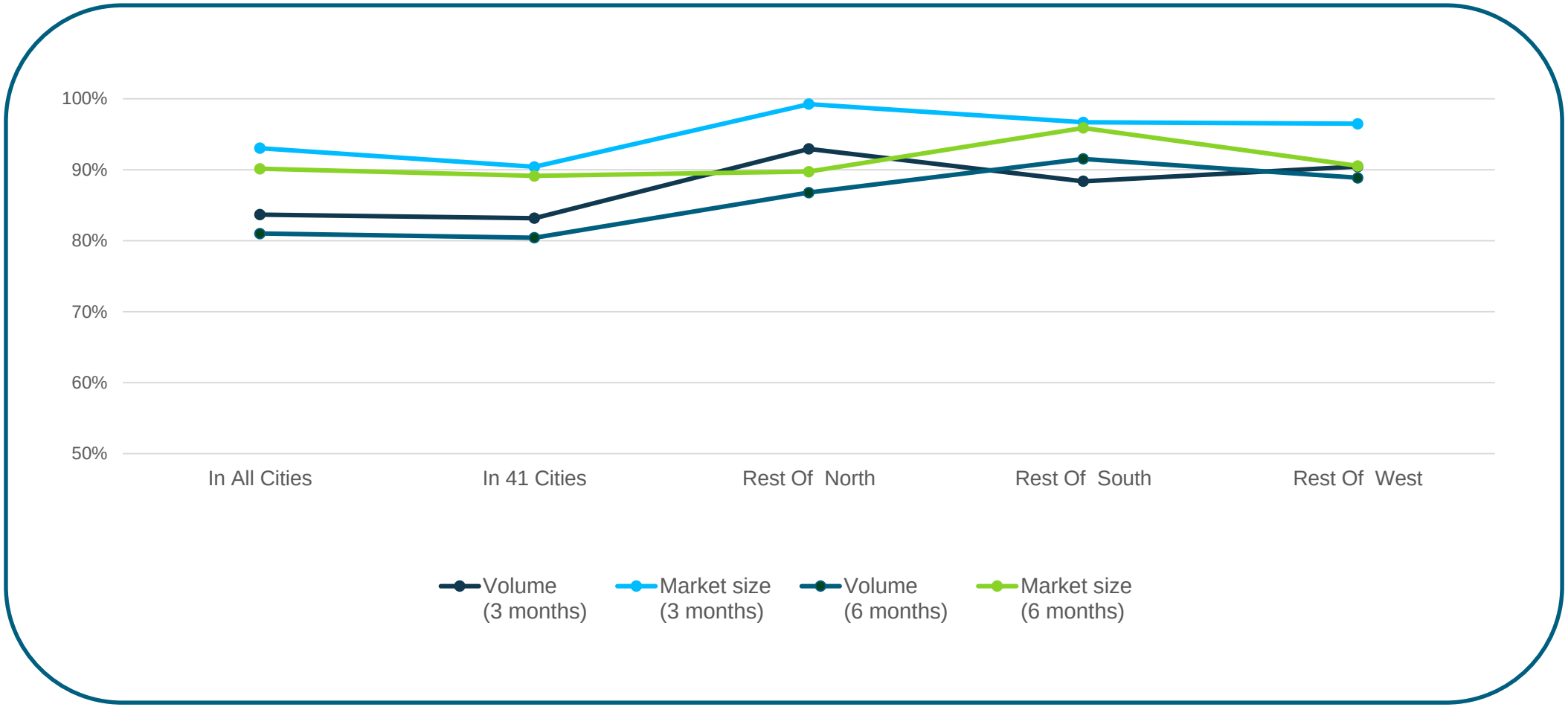


Next months accuracy on selected indicators

Scope	Accuracy August	Accuracy July	Accuracy June	Accuracy May	Accuracy April
BHP EV policy city	99%	90%	98%	99%	91%
MS	98%	94%	97%	95%	92%
BHP MS Shanghai	87%	90%	88%	99%	84%
Market size	100%	99%	99%	97%	95%
Key product market size	97%	99%	92%	92%	95%

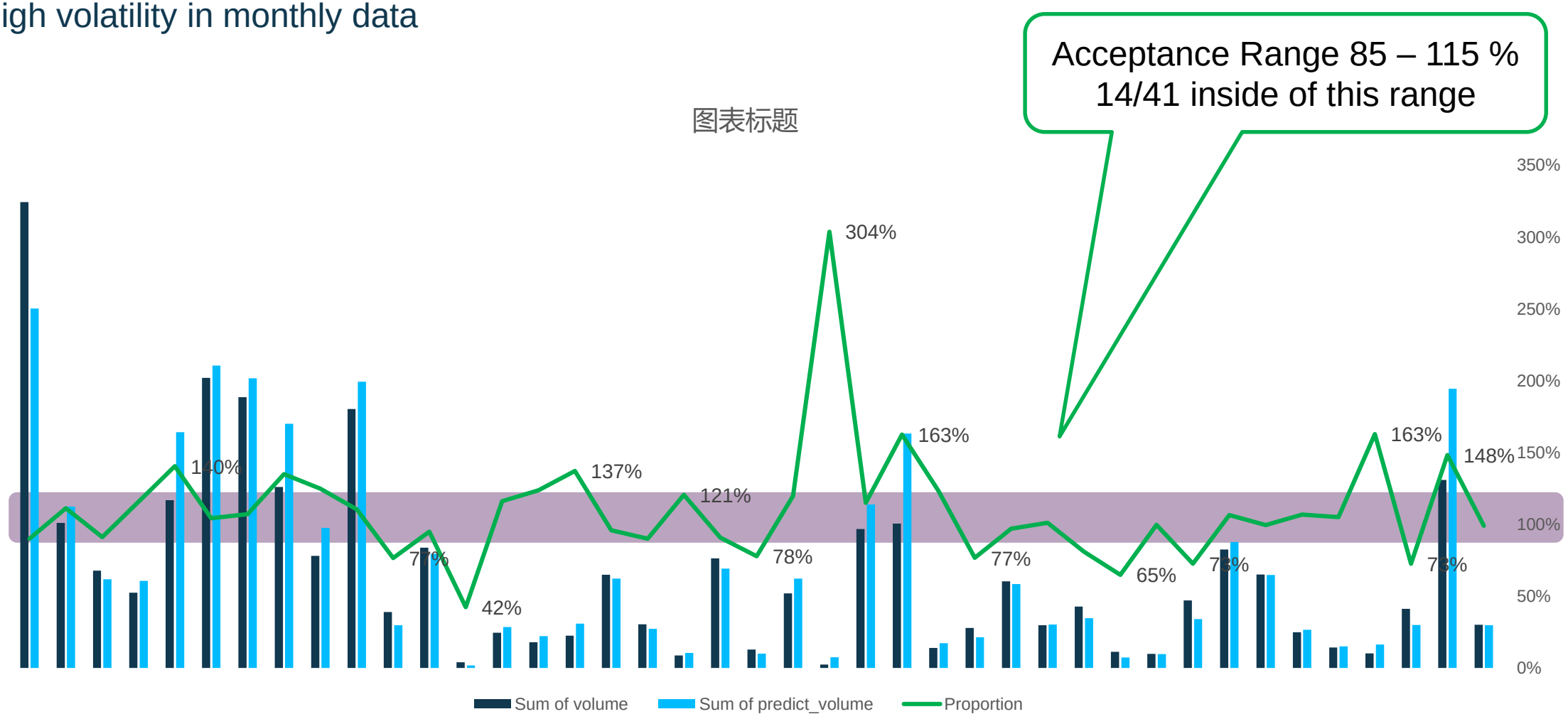
Big scope — Forecast accuracy declining the smaller the scope — Small scope

3 & 6 months product level accuracy (MTH) above 80%



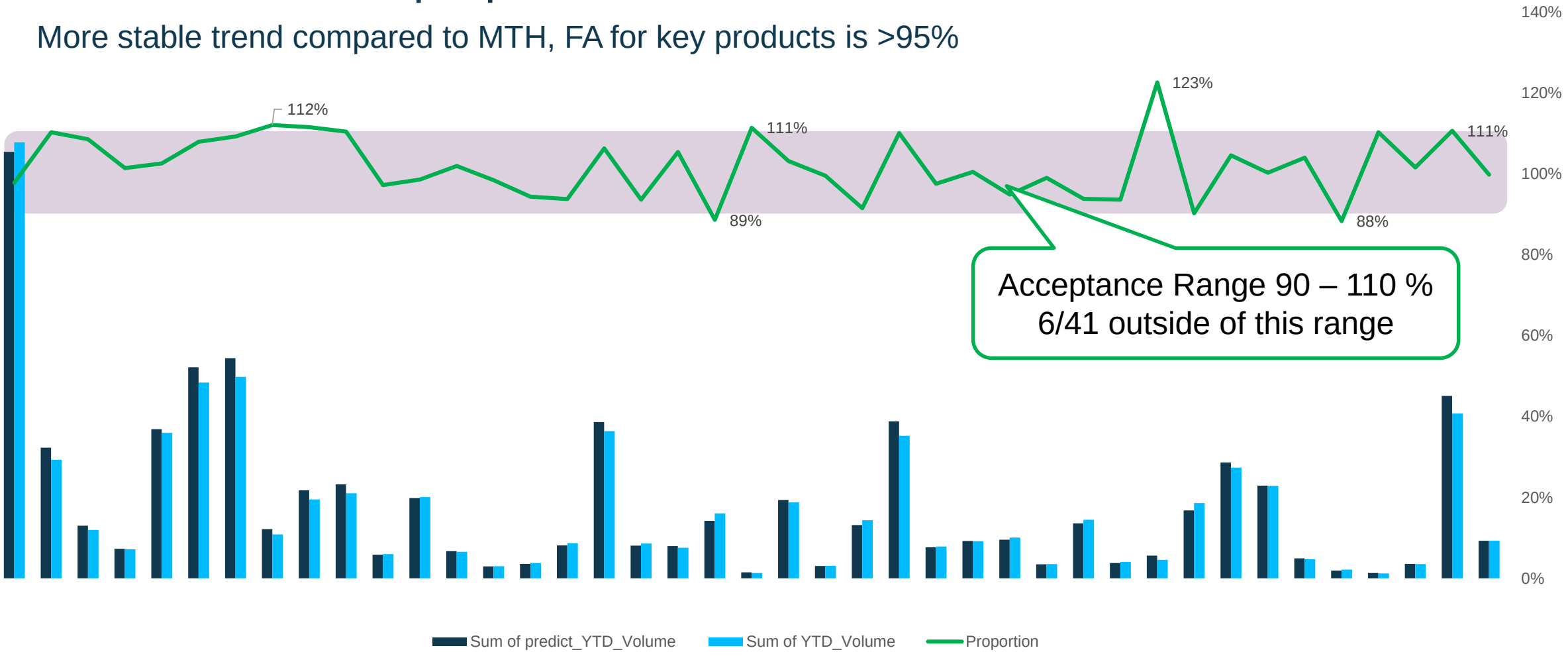
Predicted proportion of actual

High volatility in monthly data



YTD – Predicted proportion of Actual

More stable trend compared to MTH, FA for key products is >95%



Learnings

Learnings

Initial policy impact is less than expected

Strong seasonal trends

MS, EV/ EI & Sales Volume are predictable with good accuracy

Low forecast accuracy provides additional insights

Real-time EV more relevant than further predict values

Potentially re-creatable

Need to gain experience in mid-term forecast accuracy

Regular reporting of MS/ EV future trend

Regular reporting of Outlier brands & cities

谢谢

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