



Market Forecast & Analysis of Humira

Problem Statement



\$20.85 Billion

"World's best-selling drug"



7% - 10%

Price increase annually (twice the rate of medical inflation)



65%

Control of market share (in the U.S.)

Goals + Objectives



Current market understanding of Humira



Understanding Humira's contribution to AbbVie



What are the forecasting predictions for Humira?

Forecasting for Humira:

→ market share

→ price

→ impact of loss of exclusivity

& recommending the next step(s) for Humira/AbbVie





- Humira Market Forecast
 - Through 2022
- Impact of loss of exclusivity
 - How does it compare to Azilect & Remicade?
- How will Humira's performance translate to AbbVie's future

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- *Beyond Scope:*
 - *Impact of US government regulations and insurance changes to the price and market share of drugs.*
 - *Adverse event(s) that would negatively impact sales.*

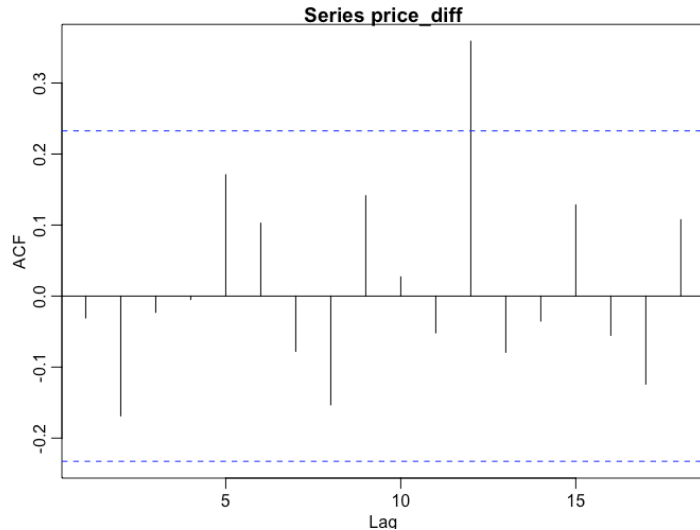
Literature Review: *Patent System*

- When patents are granted, system enables competitors to enter and drive prices down
 - Pharmaceutical products don't follow the system's design
- U.S does not yet have access to a less-expensive versions of Humira:
 - Reason: "Wall of patents" by Humira-maker AbbVie Inc
- Crumbling patent system
 - Threatens pharmaceutical innovation and pushes competition further

Literature Review: *Biosimilars*

- A biosimilar drug is developed to be similar to an original biologic whose patent has expired
 - Similar, but subtle differences due to production method
- Biosimilars face a tough competition for a slice of market share
 - Difficulty of extrapolation to other indications when the originator has multiple indications (*Humira: approved for 9 indicators*)
 - Prices of biosimilars are only discounted ~20-35%

Checking Stationarity of Data-Price



Augmented Dickey-Fuller Test

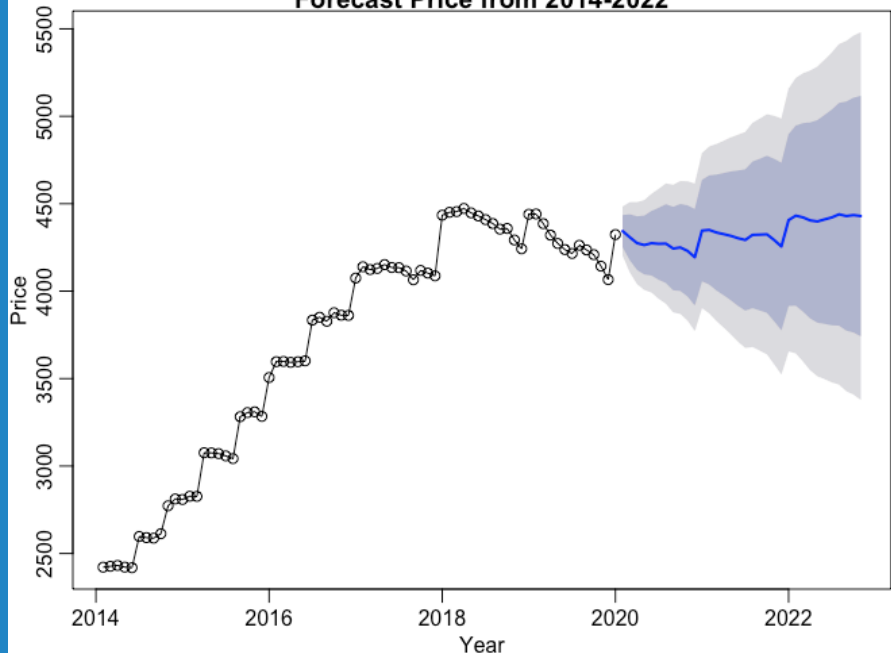
```
data: price_diff
Dickey-Fuller = -4.2099, Lag order = 4, p-value = 0.01
alternative hypothesis: stationary
```

Box-Ljung test

```
data: Humira_Price$Price
X-squared = 624.47, df = 20, p-value < 2.2e-16
```

- Very small p-value indicates that data is stationary. So we reject null hypothesis and classify this as stationary
- The values tend to degrade to zero quickly

Forecast Price from 2014-2022



- Historical data is from 2014-2019
 - Price increases
 - Peaks in 2018-2019
- Forecasting from beginning of 2020 - 2022
 - No dramatic increase
 - Levels off

```
> price_forecast
```

```
Series: price_tseries
```

```
ARIMA(2,1,2)(2,0,0)[12] with drift
```

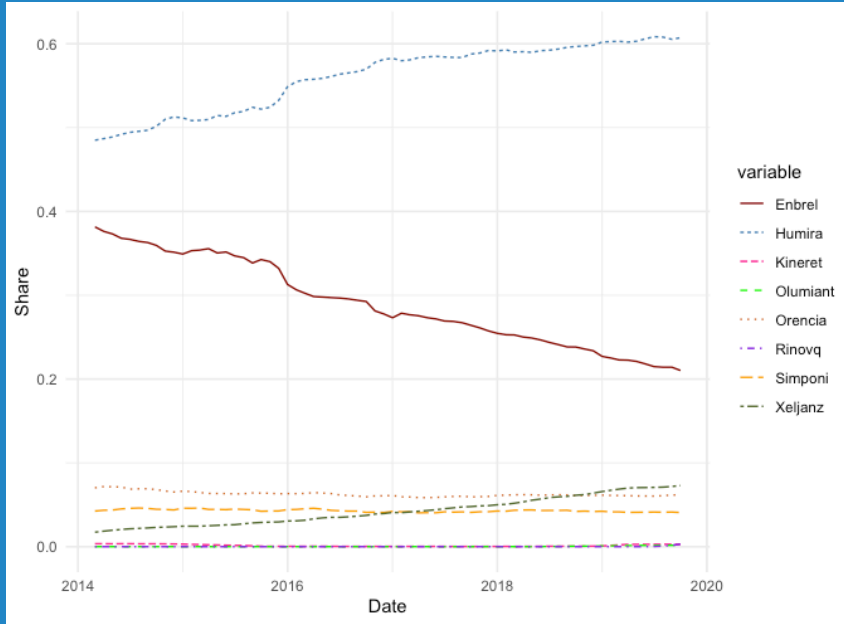
```
Coefficients:
```

	ar1	ar2	ma1	ma2	sar1	sar2	drift
	0.5722	-0.9381	-0.5482	0.7638	0.4086	0.2870	23.075
s.e.	0.1160	0.0647	0.2186	0.1121	0.1246	0.1384	16.310

```
sigma^2 estimated as 5098: log likelihood=-403.82
```

```
AIC=823.64 AICc=825.97 BIC=841.74
```

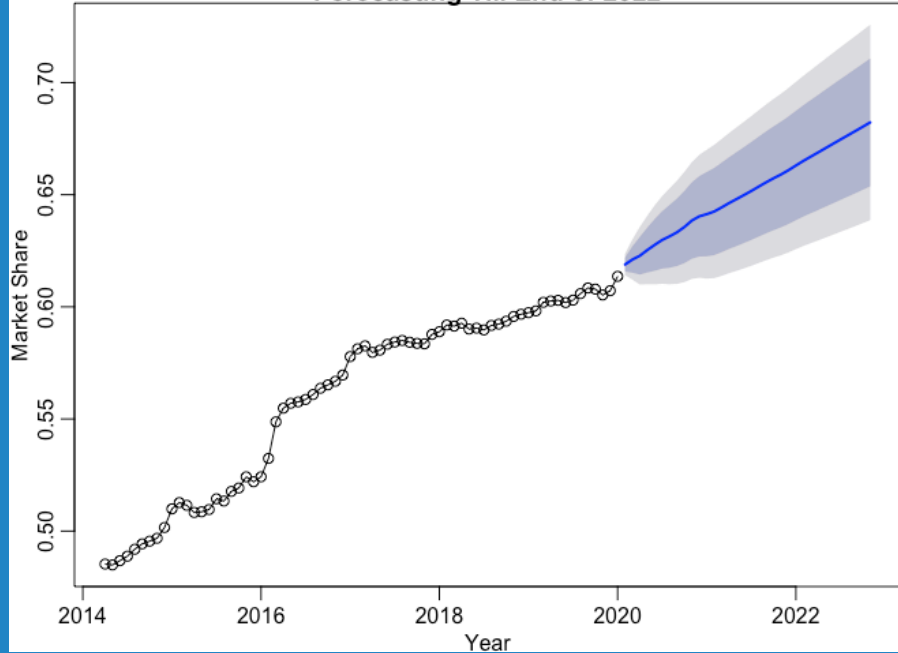
Forecasting **Price** of Humira



- Shows what is happening to the other drugs that make up the rest of the market
- Data 2014-2019
- Enbrel and Humira mirrored, with Humira increasing
- Orencia, Simponi, & Xeljanz don't make up a lot of the share

Market Share Representation of Humira

Forecasting Till End of 2022



Series: market_tseries

ARIMA(1,1,2)(1,0,0)[12] with drift

Coefficients:

ar1	ma1	ma2	sar1	drift	
-0.6365	1.2502	0.7258	-0.2103	0.0019	
s.e.	0.2113	0.1603	0.0753	0.1239	0.0004

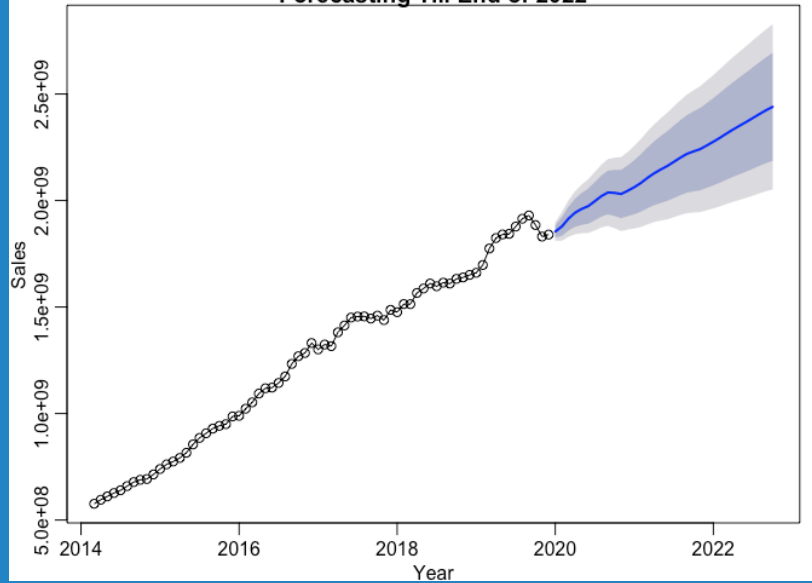
sigma^2 estimated as 5.79e-06: log likelihood=319.86

AIC=-627.72 AICc=-626.36 BIC=-614.32

- Historical data is from 2014-2019
 - Market share increases
 - Highest towards end of 2019
- Forecasting from beginning of 2020 - 2022
 - Continues to increase steadily

Forecasting **Market Share** of Humira

Forecasting Till End of 2022



- Historical data is from 2014-2019
 - Sales increases
 - Peaks towards end of 2019
- Forecasting from beginning of 2020 - 2022
 - Continues to increase in the future

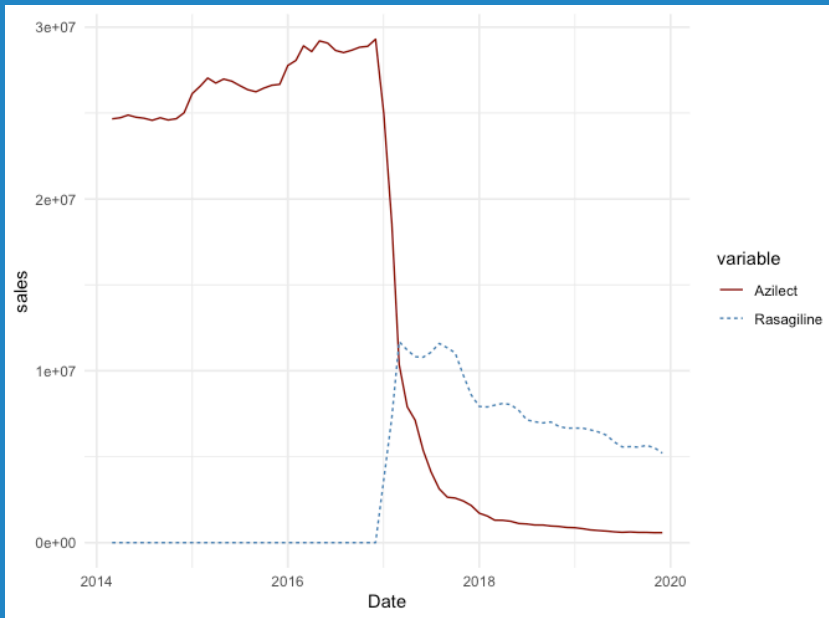
```
Series: sales_tseries
ARIMA(1,1,0)(1,0,0)[12] with drift
```

Coefficients:

	ar1	sar1	drift
	0.2066	0.3196	17980757
s.e.	0.1188	0.1268	4307441

```
sigma^2 estimated as 4.689e+14: log likelihood=-1262.5
AIC=2533 AICc=2533.63 BIC=2541.94
```

Forecasting **Sales** of Humira

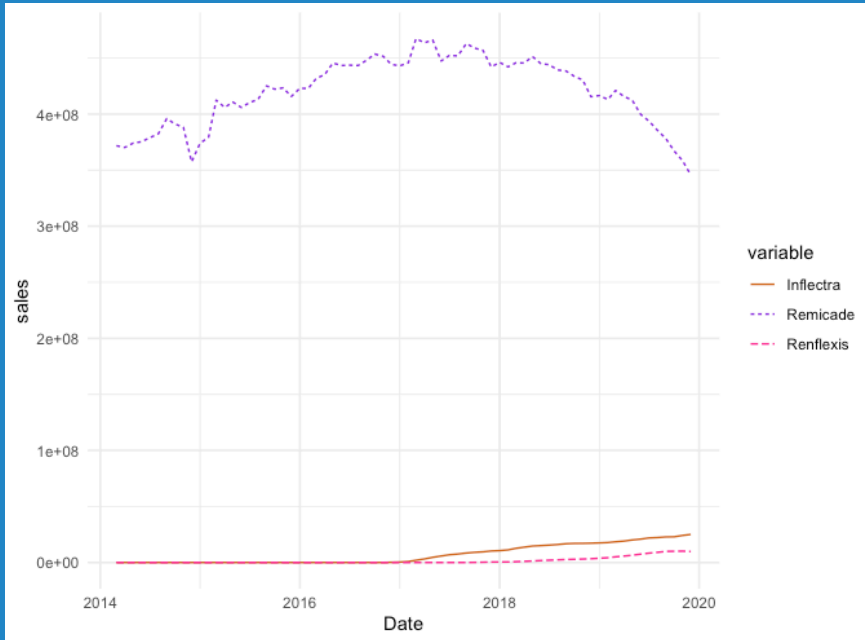


- Sales data from beginning of 2014 to end of 2019
- Rasagiline is a generic of Azilect
 - Azilect-Increase in sales from 2014-2017
 - Introduction of Rasagiline in 2017

Azilect to Generic

Taking a Look at Azilect

- Ingested tablet, received at pharmacies through prescription
 - Was the most prescribed medication for Parkinson's
- July 2016 – TEVA hiked the prices it charges by 9.9%
 - Drug companies typically copy this pattern right before the patent expires and generic versions of the drug become available
- Affording Azilect was worrisome for patients, may explain dramatic turn to Rasagiline
- For TEVA: Had a lack of competition in the field
 - Had big hopes for launch of Austedo in 2017 (drug for Huntington's disease)
 - Austedo was a success, its market share and sales are double of what Azilect ever achieved for TEVA

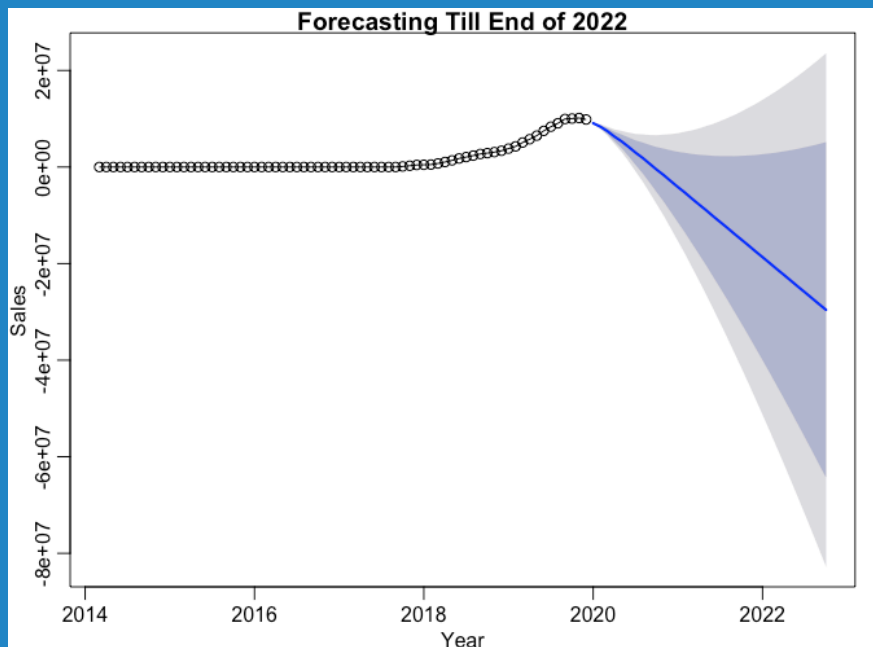


- Sales data from beginning of 2014 to end of 2019
- Inflectra & Renflexis is a generic of Remicade
 - Remicade-Increase in sales from 2014-2017
 - Introduction of Inflectra & Renflexis in 2017
 - Sales continue to increase from 2017-2019

Remicade to Biosimilar

Taking a Look at Remicade

- Infused product, bought and given through the doctor
- 2018- Remicade's patent expires
 - Biosimilars *Inflectra* & *Renflexis* introduced
- Remicade forced to decreased cost of therapy, but only by **10-15%**
 - Predicted for Humira
- Biosimilars only won over a small percentage of market share



Series: ren_tseries
ARIMA(3,2,2)

Coefficients:

	ar1	ar2	ar3	ma1	ma2
	-0.3920	-0.1248	0.5995	0.4476	0.9133
s.e.	0.1157	0.1483	0.1430	0.0651	0.0798

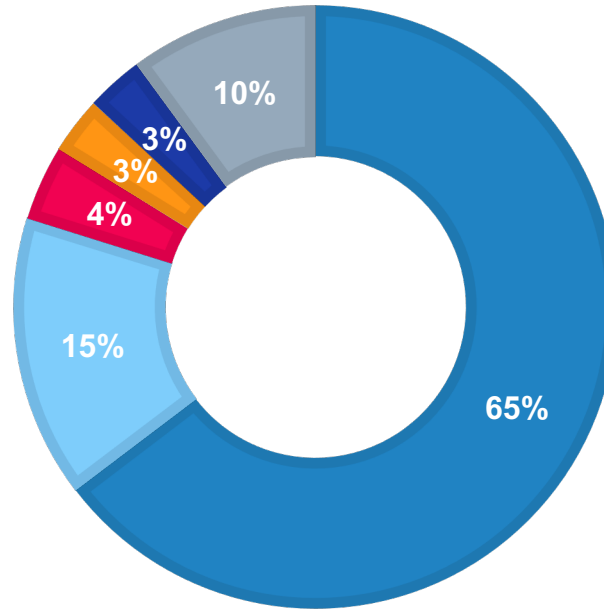
sigma^2 estimated as 9.881e+09: log likelihood=-879.03
AIC=1770.07 AICc=1771.44 BIC=1783.38

- Historical data is from 2014-2019
 - Sales increases 2019
- Forecasting from beginning of 2020 - 2022
 - Continues to decrease steadily
 - Comparison to Humira

Forecasting **Sales** for Renflexis

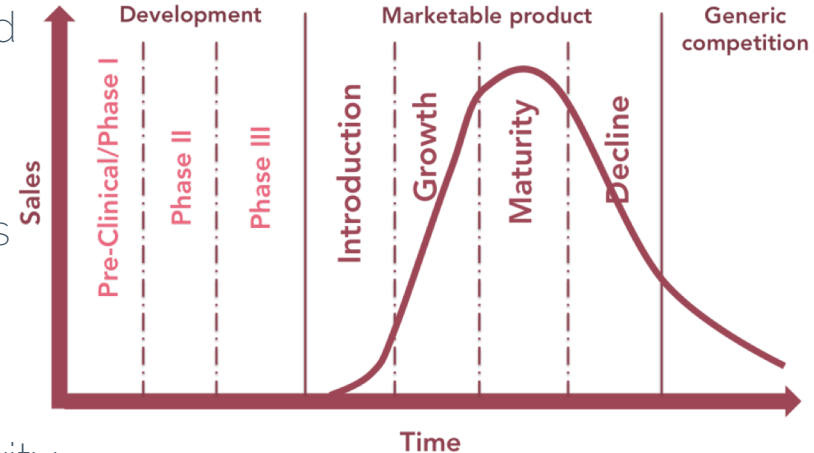
SHARE OF REVENUE (ABBVIE PRODUCTS)

■ Humira ■ Imbruvica ■ Synagis ■ Lupron ■ Creon ■ Other



How to Explain Humira's Forecast

- AbbVie's crucial Lifecycle Management Strategy
 - Aggressive pricing strategy, revenue is bound to skyrocket
 - Investment in clinical trials for increased indications
 - Development of new formulations and routes of administration
 - Humira Pen (2006)
- When new indications are approved, orphan drugs can receive +7 years of patent exclusivity



Conclusion

- Biosimilars impact differently when compared to generics
- Humira is destined to suffer “biosimilar erosion” (looking closer to 2023)
 - 2019 – saw a biggest decline in sales yet
 - In Europe's market, Humira is already suffering a decline in sales due to biosimilar competition
- Based on forecast, steady decline followed by leveling off
- AbbVie is highly strategic in its lifecycle management plan, **this is**

vital!!

Our Recommendations

- To continue success:
- Broadening portfolio of different drugs: support and complement Humira
 - “Striking drug industry gold”
 - Skyrizi (\$57mil) + Rinvoq (\$9 mil)
 - Drug industry climate will keep from using aggressive pricing strategy used for Humira
 - Will compete with cheaper biosimilars in Humira's class
 - Success of backup plan might be accelerating Humira's decline
 - Focus on long-lasting relationships with physicians to continue prescribing the AbbVie's drugs
 - Continue to attempt to retain maximum market share and profitability of Humira



Thank you!

References

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