

# PREDICTION OF PRICE FOR 700 MHZ BAND

## Group 3

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### Introduction

700 MHz is a better frequency since lower frequency implies more distance it can be used without much loss of power but in recent two auctions in India and 2016 Auction in Korea the 700 MHz band went unsold. Which is a wastage of a scarce resource on a national level. We wanted to find a way to keep a reserve price using all the auctions done on 700 MHz spectrum until now.

### Data preprocessing

We collected all the auction data from the Spectrum data base given to us. Then we have aggregated the data as per the country and the auction date so that we can convert the local currency used for auction into the US Dollar using the conversion rate at the time of the auction.

We calculated the total bandwidth allotted (paired + unpaired). Then, we found out the price in US dollars for 1 MHz bandwidth of 700 MHz frequency. We used the licence duration to calculate the Price paid by winner per 1 MHz bandwidth of 700 MHz frequency per year in US dollars.

### Price Prediction

Now, we got the data which is a fee for 1 year of 1MHz usage of 700 MHz frequency for (alpha3codes = BRA, CAN, DEU, CHL, FIN, FJI, FRA, GBR, NZL, TWN, USA) and we used both linear regression and quadratic regression but we have got better accuracy in the latter one. Below is the equation for the quadratic expression for the reserve price and Headline price (final price)

Reserve price:

$$y = -71379.03 - 15983.37 * x + 13209.47 * x^2$$

Headline price

$$y = -109618 + 56472.28 * x + 5896.945 * x^2$$

### Prediction of Reserve price

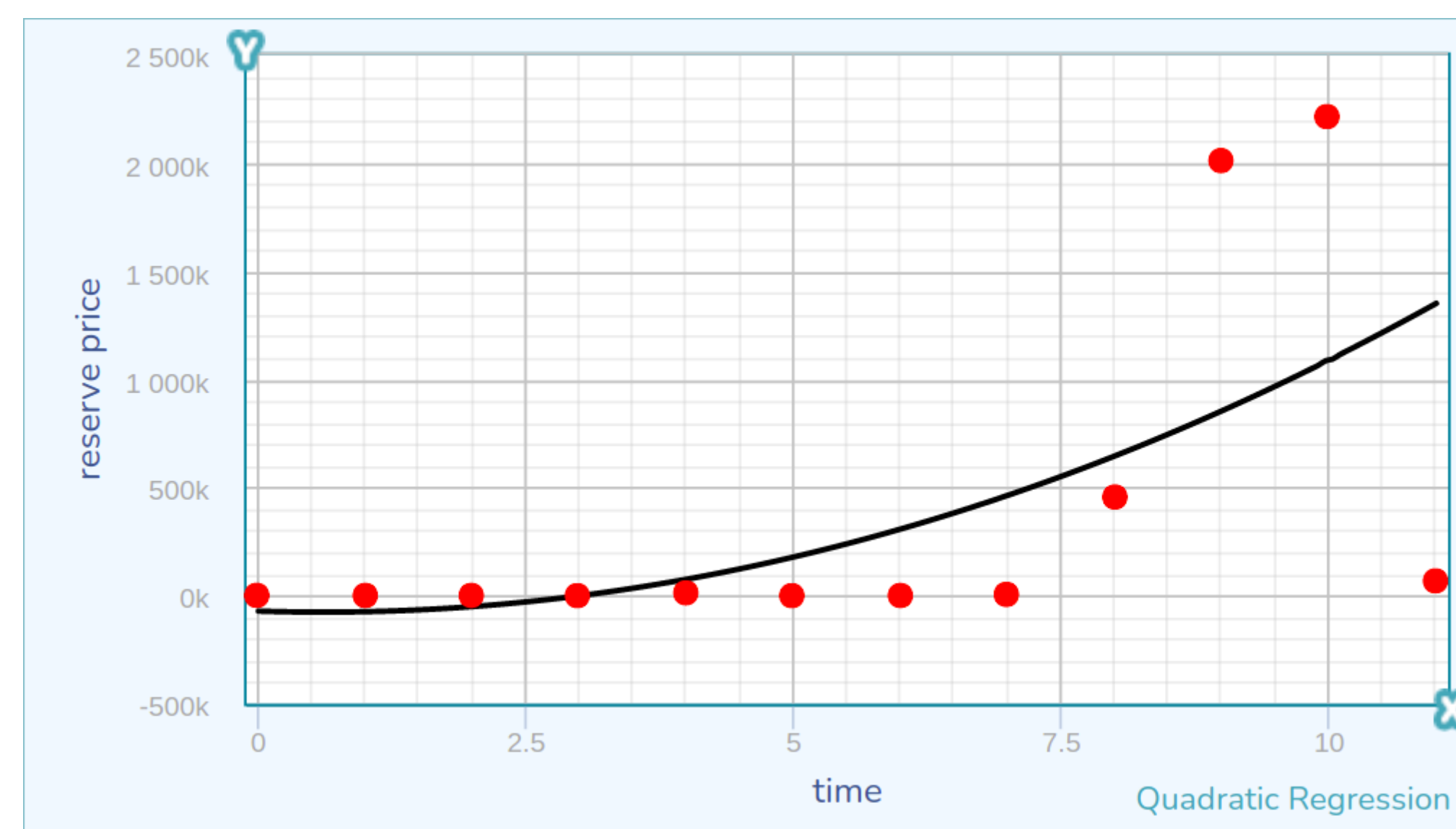


Fig. 1: Reserve Price in USD vs Time in years

### Prediction of headline price

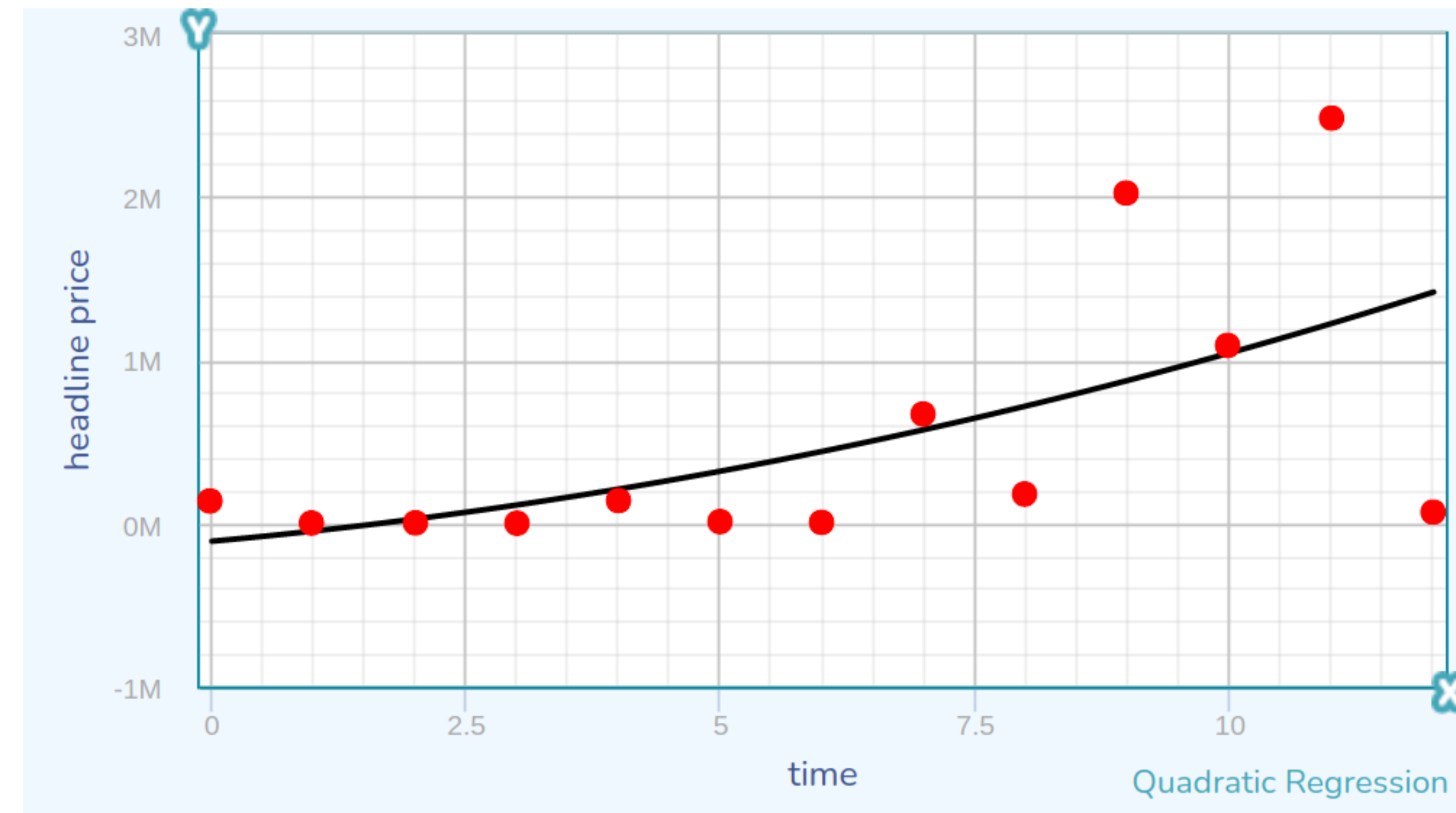


Fig. 2: Headline Price in USD vs Time in year

### Comparing Predicted Prices

As per the predicted Reserve price for the licencing fee for a year of 1MHz Bandwidth of 700 MHz frequency we have got the in India 5.047 Million USD as per the reserve value given by the Indian TRAI which is 17.56 which is three times more price than our predicted model price. Similarly in Korea the reserve price for a year of 1MHz Bandwidth of 700 MHz frequency is given as 10 Million USD in 2016. But our model suggests 3.17 Million for licensing a year of 1MHz Bandwidth of 700 MHz frequency. so these bandwidth went unsold because of reserve price setting practices without using any other statistic than last auction winner's bid price. which may not be a better approach for the setting of the reserve price.

### Predicted Reserved vs Real reserved Price in Million USD for 700MHz

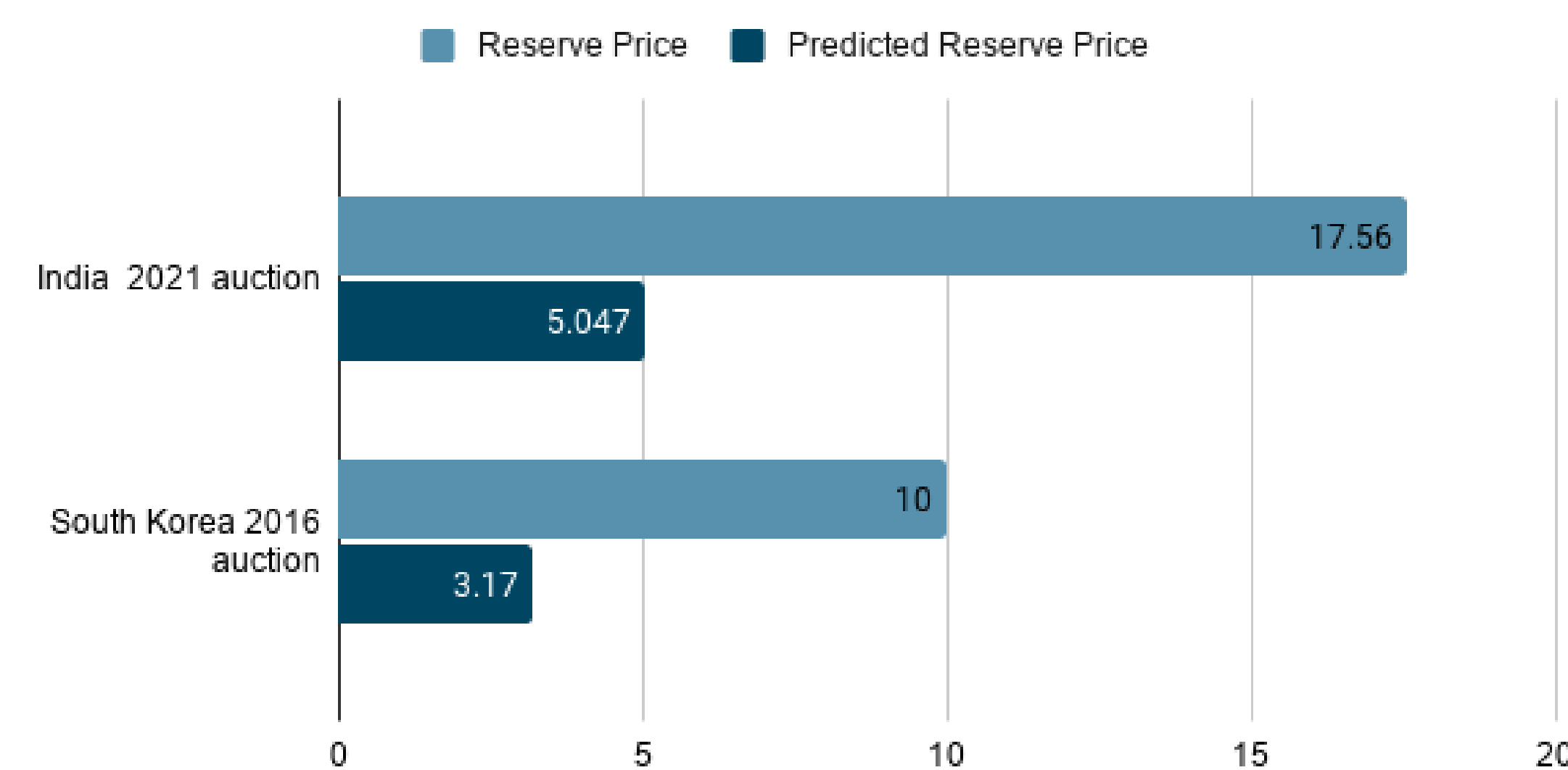


Fig. 3: Predicted vs Actual reserve prices for India and South Korea.

### Conclusion

There are cases of Bandwidth going unsold in SMRA auction which are very fair in terms of maximising the profit for the auctioneer. That implies only constraint which is stopping bidders to bid is the reserve price. If the reserve price is stopping a potential bid that implies that the whole bandwidth goes to waste which is a multi billion dollar affair.

This is a modest model in which we used the upper level data of reserve price and made a prediction for the auction's reserve price. But we found the increase in reserve price to be more than double in two cases which led to the bidders not participating in the auction.

### Future Work

We can use different rounds of the auction to find the patterns which will increase or decrease the last bid.

We can also use the latest conversion of US Dollar and inflation rates to pinpoint the values paid for the licence to make the model more accurate.

We can train Neural networks to make the prediction of price using the archived data.

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### References

#### References

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Deuk-Won Kim\* Asian Journal of Information and Communications