Project VIX

Predicting market volatility

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Problem Statement - Can we predict market volatility?

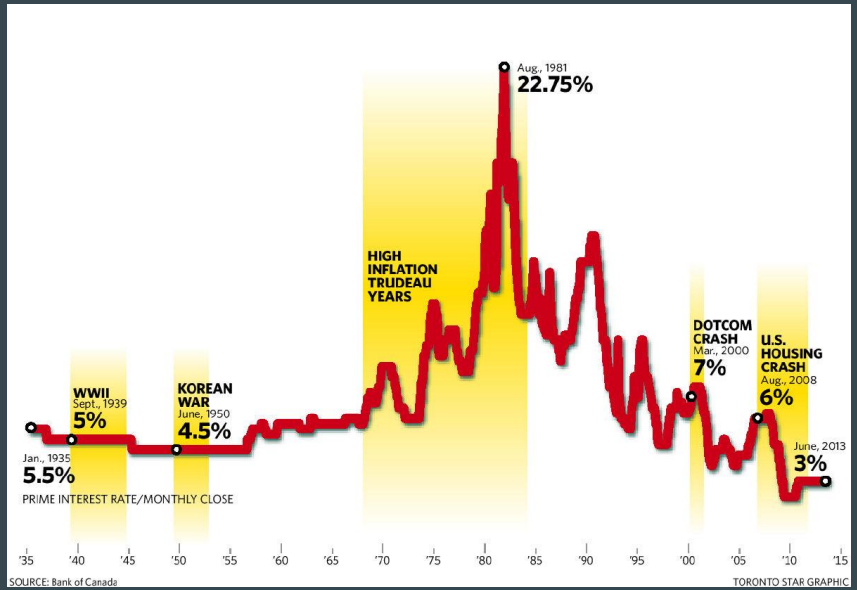
Part 1: Time series analysis

- Data isn't independent
- ARIMA & Facebook Prophet models

Part 2: Augment with exogenous data

- SARIMAX model
- Federal Prime Rate data

Prime Rate theorized to rise before market downturn



Data Sources

Data Available

- **Scraped** Federal Prime Rate history
- **Downloaded** Historical Vix data

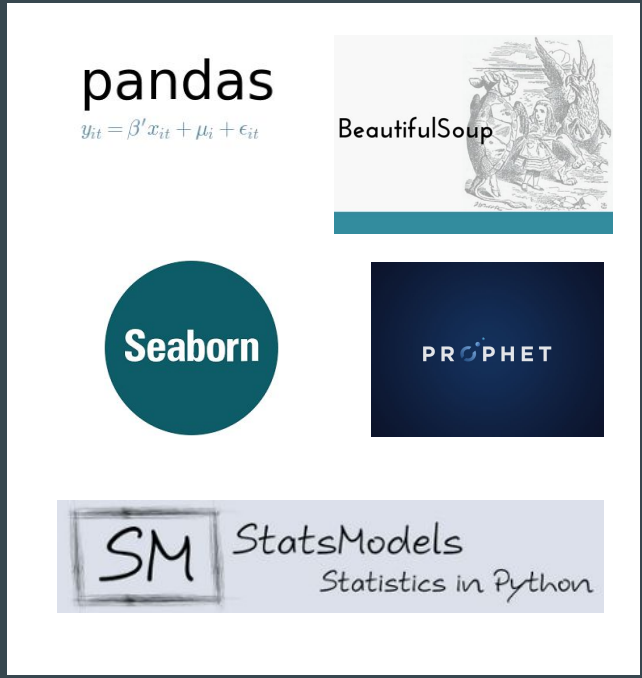
Time Frame

- **Federal Prime:** 1920s-Today
- **Vix:** 1990s-Today

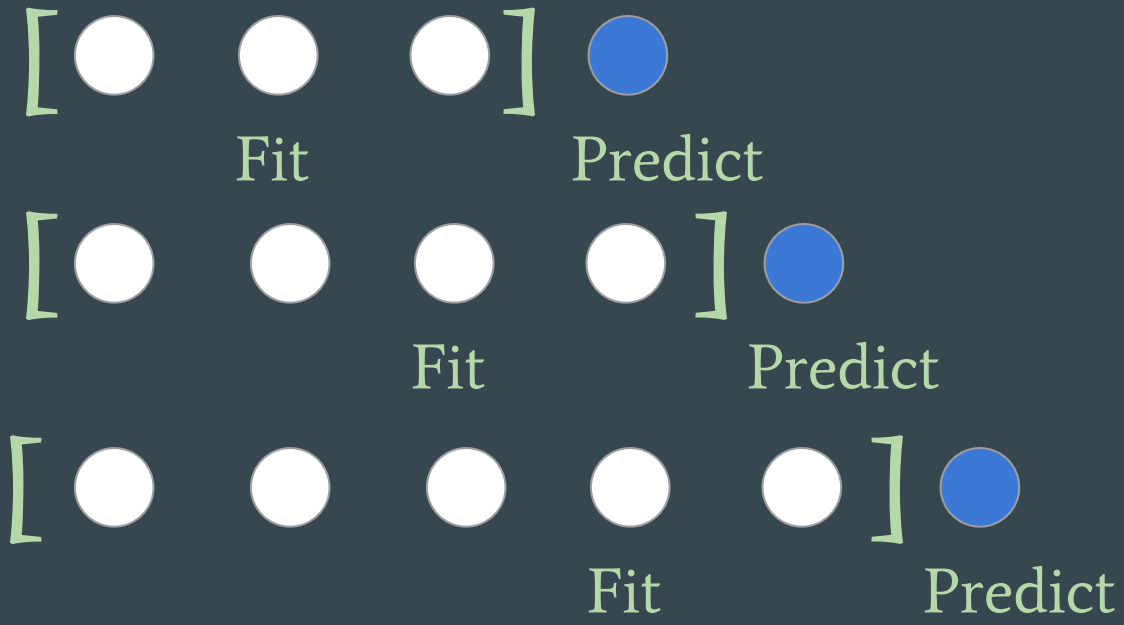
Process & Tools

1) Cleaned, normalized & split data
2) Optimized models in three ways:
- Partial & autocorrelation analysis
- Grid search algorithm for parameters
- Time window refitting

Tools Used

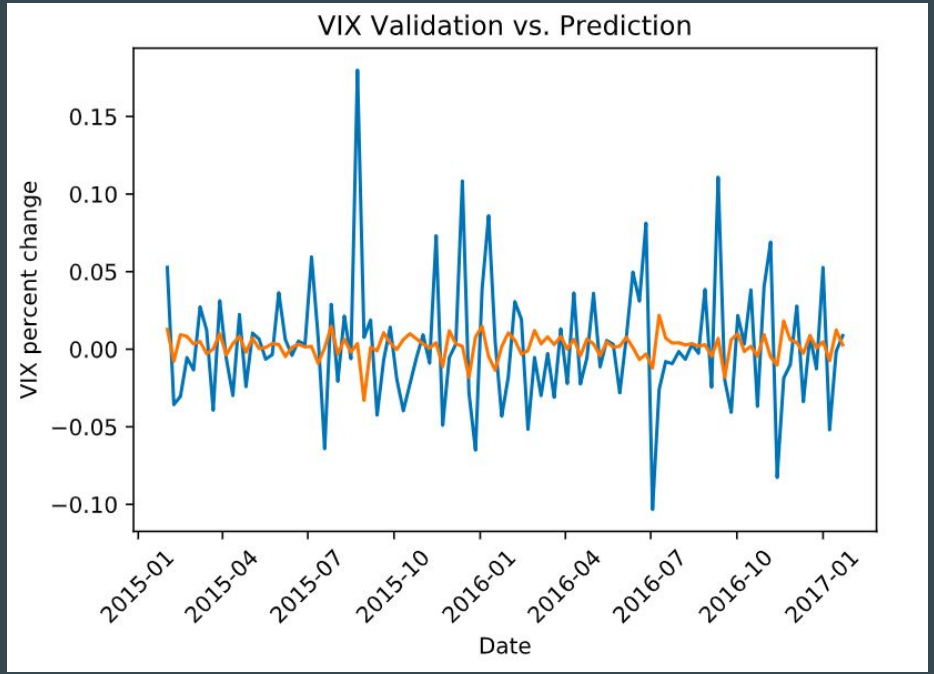


Time window refitting - Each dot is 1 data point



Model optimization made small, yet consistent differences

	RMSE	% Change
AR1	0.03999	-
AR1 (Window)	**0.03948***	**1.28**
ARMA-1-1	0.03999	0.00
SARIMAX	.04001	-0.03
Facebook Prophet	0.04031	-0.80



*Test data AR1 Window RMSE is .03947, .03% better than baseline

Analysis conclusions

- Time series analysis challenging on highly analyzed market indices
- Federal prime rates aren’t fast economic indicators

Future work: Try different exogenous data or other sources

- Use computers with larger processing power
- Include other economic data
- Try non-linear prediction models

Thanks!

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Appendix

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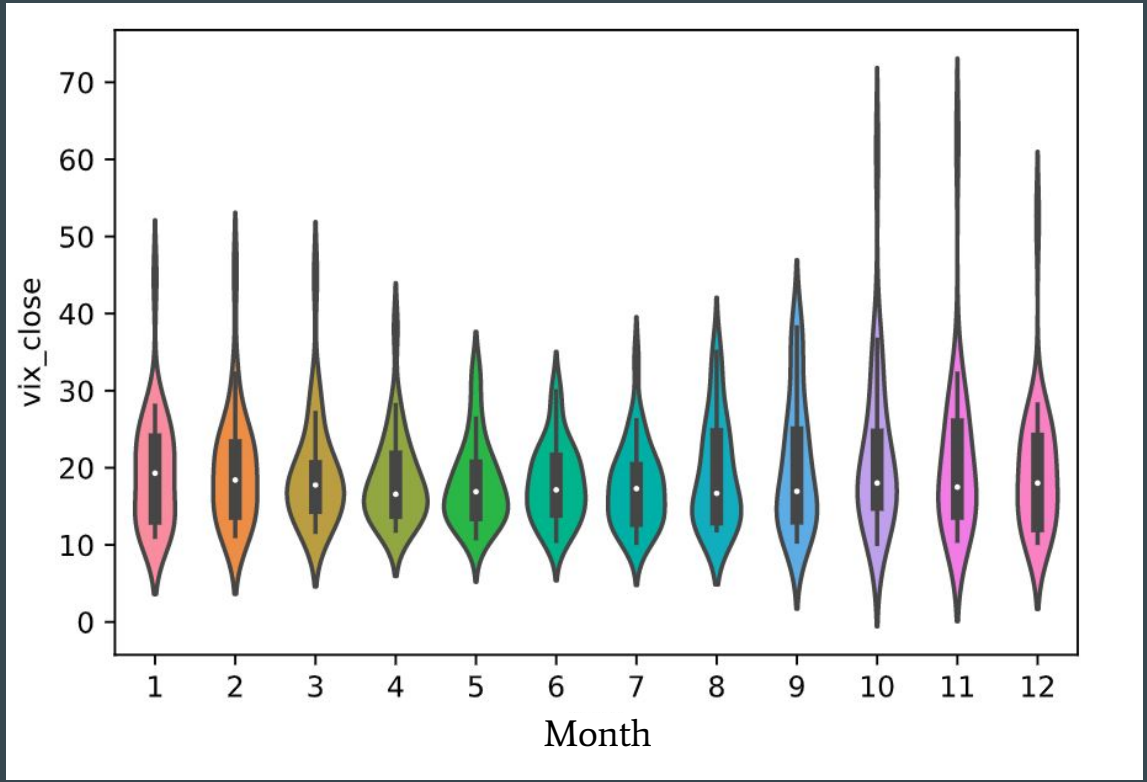
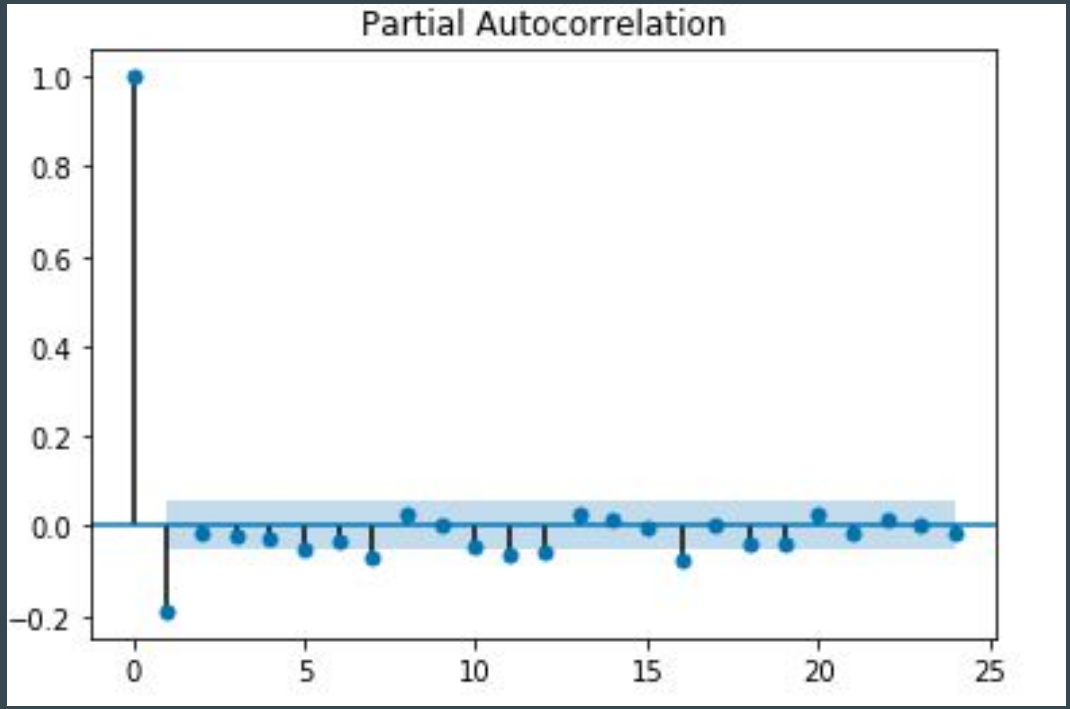
Data Seasonality



Weekly Vix Partial Autocorrelation



Weekly Vix Partial Autocorrelation