TRANSLATING THE WORDS AND NUMBERS OF OFFICIAL FORECASTS INTO PREDICTIONS OF AMOUNT AND PROBABILITY OF PRECIPITATION

Location of Melbourne

Introduction

Australian Bureau of Meteorology day-to-day weather forecasts are presented in a format that comprises:

- A worded description of the expected weather;

- A brief précis;

- Estimates of minimum and maximum temperature;

- Estimates of probability and amount of precipitation.

Example of a Forecast

Saturday 7 January

Min **18**   Max **34**

Shower or two developing.

Possible rainfall: **1 to 6 mm**

Chance of any rain: **60%**

Melbourne area

Partly cloudy. Medium (60%) chance of showers. Winds northerly 25 to 35 km/h shifting south to southwesterly 20 to 30 km/h during the day.

Interpretation

What does the possible rainfall amount mean?

Possible rainfall: **5 to 10 mm**

The possible rainfall amounts help to show how rainfall might vary according to the type of weather in a given time period. Both numbers relate directly to a chance of receiving at least that amount of rain.

The first number (5 mm in this example) represents a 50% chance of at least that amount of rain occurring.

The second number (10mm in this example) represents a 25% chance of at least that amount of rain occurring.

On days where we expect showers or thunderstorms, the possible rainfall amounts might be quite different, for example, 5 to 30 mm. When steady rainfall is expected over a wide area, the possible rainfall amounts might be similar, for example, 10 to 15 mm.

Methodology

Using:

A data base of official précis forecasts for Melbourne;

A data base of official estimates of the anticipated probability and amount of precipitation;

A data base of corresponding observations.

Statistical relationships are established between:

The words and numbers contained in the official forecasts, and what eventuates in terms of the likelihood and amount of precipitation.

The multiple linear relationship between the words used, and what eventuated in terms of *the amount of precipitation*

Word	t Statistic	Probability	COEFFICIENTS 0.142
RAIN	40.6	0.000%	2.106
SHOWERS	17.7	0.000%	0.947
SHOWER	13.1	0.000%	0.485
HEAVY	9.0	0.000%	2.847
THUNDER	7.3	0.000%	0.517
DRIZZLE	5.6	0.000%	0.520
EASING	4.4	0.000%	0.294
BECOMING	1.7	4.223%	0.097
FOG	-0.3	37.940%	-0.020
CLOUD	-1.7	4.776%	-0.073
FINE	-3.0	0.135%	-0.113
LATE	-3.6	0.018%	-0.144
CLEARING	-4.4	0.001%	-0.188
CHANCE	-5.0	0.000%	-0.267
FEW	-7.4	0.000%	-0.428
LITTLE	-12.2	0.000%	-0.931

The multiple linear relationship between the words used, and what eventuated in terms of *the amount of precipitation*

It may be seen that the most positively related words (in order) are:

- RAIN;
- SHOWERS;
- SHOWER;
- HEAVY; and,
- THUNDER.

  The most negatively related words (in order) are:

- LITTLE;
- FEW;
- CHANCE;
- CLEARING; and,
- LATE.

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The multiple linear relationship between the words used, and what eventuated in terms of *the likelihood of precipitation*

Word	t Statistic	Probability	COEFFICIENTS 9.474
RAIN	32.2	0.000%	74.807
SHOWER	20.7	0.000%	34.332
SHOWERS	14.1	0.000%	33.888
DRIZZLE	6.4	0.000%	26.354
THUNDER	4.9	0.000%	15.669
BECOMING	3.8	0.008%	9.541
EASING	1.3	10.103%	3.790
HEAVY	1.0	16.247%	14.004
CLOUD	-1.3	10.329%	-2.485
FOG	-1.6	5.181%	-4.728
FEW	-2.1	1.614%	-5.568
FINE	-2.4	0.793%	-4.073
LATE	-2.7	0.382%	-4.808
CLEARING	-2.9	0.190%	-5.544
CHANCE	-5.4	0.000%	-12.959
LITTLE	-7.9	0.000%	-26.815

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# Trend in the % variance of the precipitation amount explained by the worded component
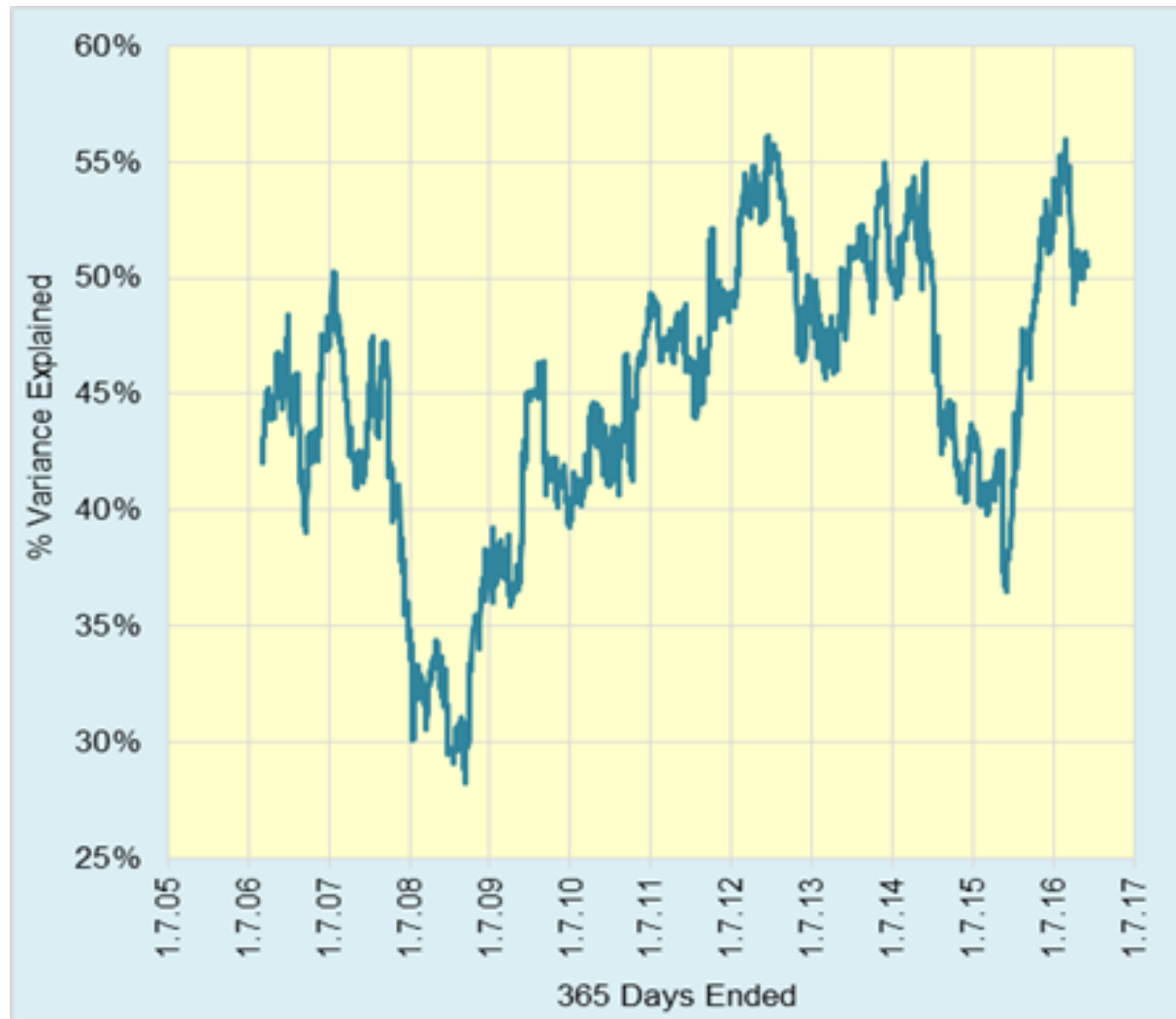
Trend in % variance of precipitation amount explained by an equation that optimally combines official words & estimates

Trend in the % variance of the precipitation likelihood explained by the worded component
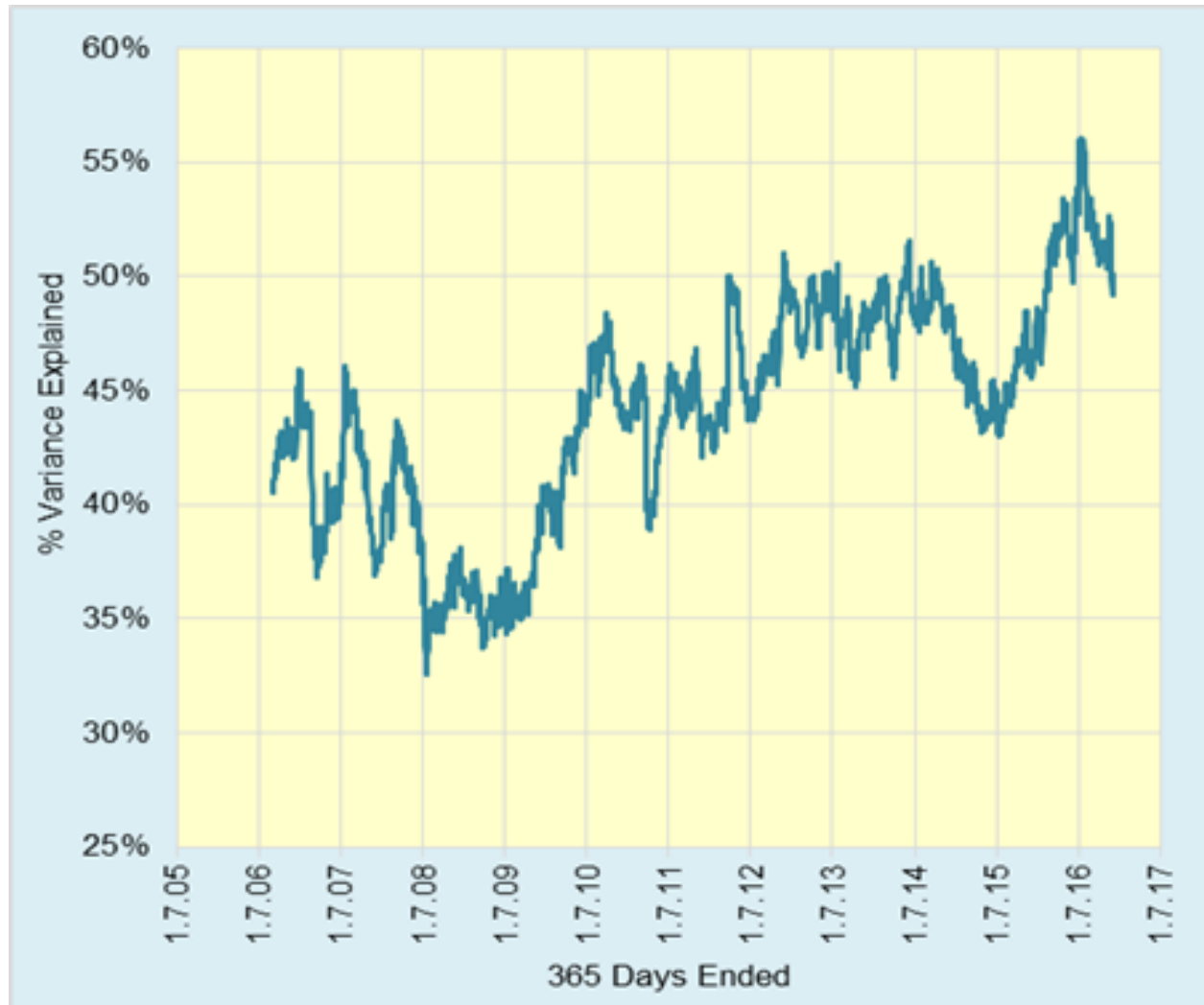
Trend in % variance of precipitation likelihood explained by an equation that optimally combines official words & estimates
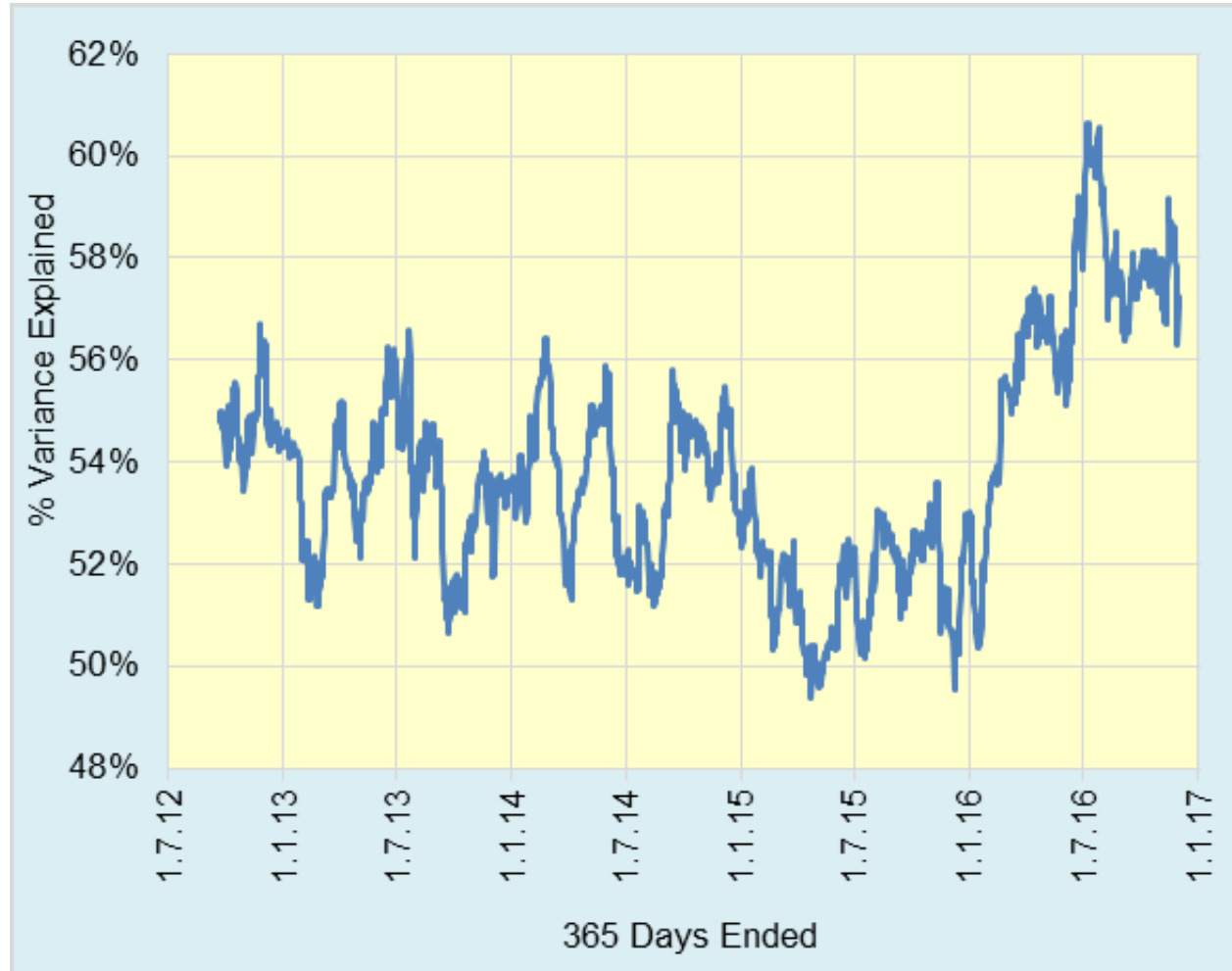
Summary

An extended data-base of official worded forecasts has been combined with corresponding data bases of observations, and also of official estimates of the anticipated probability and amount of precipitation. Statistical relationships have then been established between the various data bases:

• *To indicate what words are most likely to suggest the likelihood and amount of precipitation;*
• *To provide a measure of trends in the accuracy of the worded forecasts taken separately;*
• *To provide a measure of trends in the accuracy of the worded forecasts taken in combination with the numerical estimates.*

TRANSLATING WORDED FORECASTS INTO QUANTITATIVE PREDICTIONS

Thank You