

## **The Vancouver Stock Exchange Sources:**

### ***1. The Wall Street Journal November 8, 1983, p. 37:***

#### **Ever Had Problems Rounding Off Figures? This Stock Exchange Has**

By Kevin Quinn

Staff Reporter of The Wall Street Journal

Things were looking grim at the Vancouver Stock Exchange.

Brokers and investors on the free-wheeling penny-stock market wondered where the North American bull market had gone, as the exchange index kept dropping. The index, which was established in January 1982 at a level of 1,000, recently has been hitting lows in the 520 range.

Now the exchange says it goofed in calculating the index. Donald Hudson, the exchange's embarrassed president, estimates the true value at between 900 and 1,000, or maybe even over 1,000.

"There's no question that it's an oversight; we won't do it again," he says.

From the start, the usefulness of the exchange's index has been debated. Its most controversial aspect is that all stocks count equally. Most other indexes are weighted so that big companies count more than little ones. But whatever usefulness the index had was lost as a result of the mistake.

The index is based on the selling price of all 1,400 or so stocks listed on the exchange. Every time a stock price changes, which happens 2,800 times on an average day, a computer recalculates the index to three decimal places.

The mistake was made in calculating the last decimal place. If the index stood at, say, 540.32567, the computer simply dropped the last two digits, making it 540.325. Instead, it should have rounded off the last digit, making the index 540.326.

Other indexes, like the Standard & Poor's 500, routinely do that, but the Vancouver exchange hadn't consulted them. When the mistake was made a few thousand times a day, the index slipped by up to a point or two daily. Since the mistakes were cumulative, the distortion increased daily, too.

Peter Brown, the exchange's former chairman, and his colleagues knew something was awry when the index wouldn't climb over 1,000 last February even though the exchange was setting records for volume and value. So they started an investigation, and the mistake was found.

Now the exchange intends to recalculate the index for the past 22 months, and it has hired Wilshire Associates of Santa Monica, Calif., to study whether the index is useful even at the best of times.

Mr. Brown, for one, doesn't think so. "We've got a very, very poor system," he says. The consultants' report is expected by year-end.

## **2. *The Toronto Star, Tuesday November 29, 1983* (November 19 is wrong)**

### **Vancouver stock index has right number at last**

**By Wayne Lilley, Toronto Star**

Unsuspecting investors in Vancouver Stock Exchange issues have done a double-take when the speculative resource-oriented exchange opened for trading yesterday.

The index measuring activity on the exchange sat at 1098.892, mysteriously up 574.081 points from Friday's close.

But VSE stock prices were unchanged in the cold light of day. Rather, the change in the index represents three weeks of work by consultants, correcting mistakes in index calculation that have been compounding themselves for the 22 months the index has been in operation.

### **Digit lopped**

The problem, said exchange spokeswoman Dawn Seasons, was that the index representing all 1,500 stocks on the exchange is calculated to four decimal places but only printed to three.

Instead of rounding off the last digit, the index department at the exchange has been truncating it – lopping it off and forgetting it. Because the index represents all stocks on the VSE and thus changes with each trade, there are often as many as 3,000 index changes a day.

The result, said Seasons, was a loss of an index point a day, or 20 points a month.

### **Index lowered**

“A year after the index began, it was sitting at 725 and it should have been at 960.

As embarrassing as the whole affair has been for the VSE, things could have been worse. Had the exchange introduced options based on the rise and fall of the index – a feature of the Toronto Options Exchange planned for next January – the VSE would have had to adjust wins and losses of investors.

As it was, the exchange only had to pay for three weeks of computer work and the fees of consultants brought in from Toronto and California to put the index back in order, Seasons said.

3. **B.D. McCullough and H.D. Vinod**  
**Journal of Economic Literature Vol XXXVII (June 1999), pp. 633-665**

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Improper attention to the method of rounding can produce disastrous results. The Wall Street Journal (November 8, 1983, p. 37) reported on the Vancouver Stock Exchange, which created an index much like the Dow-Jones Index. It began with a nominal value of 1,000.000 and was recalculated after each recorded transaction by calculation to four decimal places, the last place being truncated so that three decimal places were reported. Truncation to the fourth decimal of a number measured to approximately  $10^3$  might seem innocuous. Yet, within a few months the index had fallen to 520, while there was no general downturn in economic activity. The problem, of course, was insufficient attention given to the method of rounding. When recalculated properly, the index was found to be 1098.892 (Toronto Star, November 29, 1983).

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