



# **Forecasting the Stock Market Cycle in the U.S. and Canada**

**Robert Lamy**

[www.theforecastingadvisor.com](http://www.theforecastingadvisor.com)

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## **I. Forecasting the Stock Market Cycle in the U.S.**

- Chronology of Bull and Bear Markets
- Investment Strategies, Bear Markets, and Rate of Returns
- Popular Bear Market Indicators
- Key Features of the Model
- Historical Performance in Predicting Bull and Bear Markets
- Backtesting Test

## **II. Forecasting the Stock Market Cycle in Canada**

- Chronology of Bull and Bear Markets
- Key Features of the Model
- Historical Performance in Predicting Bull and Bear Markets

## **III. A Proposal for Stock Investment Decision Process**

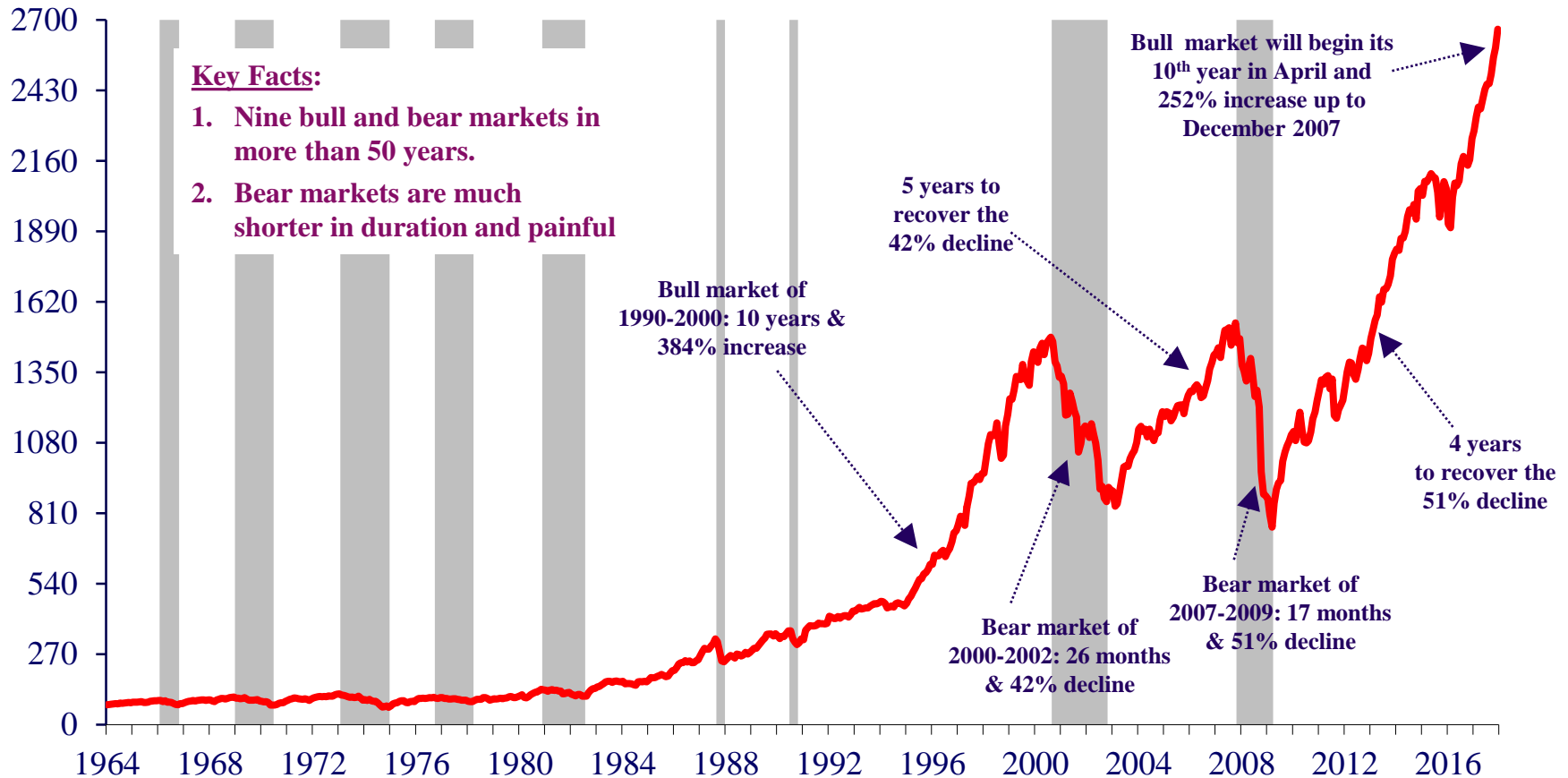


# **Forecasting the Stock Market Cycle in the U.S.: Chronology of Bull and Bear Markets**



# S&P 500 Index and Bear Markets

level



Source: Federal Reserve Bank of St-Louis Fred Database, monthly data. Last data point is December 2017. The shaded areas represent bear markets. Bull markets are between shaded areas.

## Performance of the S&P 500 Index in Bull Markets

Bull Market <sup>1</sup>		Duration (in months)	Increase (in %)
Start	End		
November 1966	December 1968	26	38
July 1970	January 1973	31	57
January 1975	September 1976	21	57
April 1978	November 1980	32	53
August 1982	August 1987	61	201
January 1988	June 1990	30	50
November 1990	August 2000	118	384
November 2002	October 2007	60	80
April 2009		104 <sup>2</sup>	252 <sup>2</sup>
Average		54	130

1. There are no official chronology for the U.S. stock market cycle. The chronology for the bull markets is the chronology reported in the economic and financial literature.
2. Up to December 2017.



## Performance of the S&P 500 Index in Bear Markets

Bear Market <sup>1</sup>		Duration (in months)	Decline (in %)
Start	End		
February 1966	October 1966	9	-17
January 1969	June 1970	18	-29
February 1973	December 1974	23	-43
October 1976	March 1978	18	-16
December 1980	July 1982	20	-19
September 1987	December 1987	4	-27
July 1990	October 1990	4	-15
September 2000	October 2002	26	-42
November 2007	March 2009	17	-51
Average		15	-29

1. There are no official chronology for the U.S. stock market cycle. The chronology for the bear markets is the chronology reported in the economic and financial literature.



## Relationship between Stock Market and Business Cycles in the United States

Start of the bear market	Start of the recession <sup>1</sup>	# of months before (-) or after (+) the start of the recession	Start of the bull market	Start of the expansion <sup>1</sup>	# of months before (-) or after (+) the start of the expansion
Feb. 1966			Nov. 1966		
Jan. 1969	Jan. 1970	-12	July 1970	Dec. 1970	-5
Feb. 1973	Dec. 1973	-10	Jan. 1975	April 1975	-3
Oct. 1976			April 1978		
	Feb. 1980			August 1980	
Dec. 1980	August 1981	-8	Aug. 1982	Dec. 1982	-4
Sep. 1987			Jan. 1988		
July 1990	August 1990	-1	Nov. 1990	April 1991	-5
Sep. 2000	April 2001	-7	Nov. 2002	Dec. 2001	+12
Nov. 2007	Jan. 2008	-2	April 2009	July 2009	-3
<b>Average</b>		<b>-7 months</b>	<b>Average</b>		<b>-4 months<sup>2</sup></b>

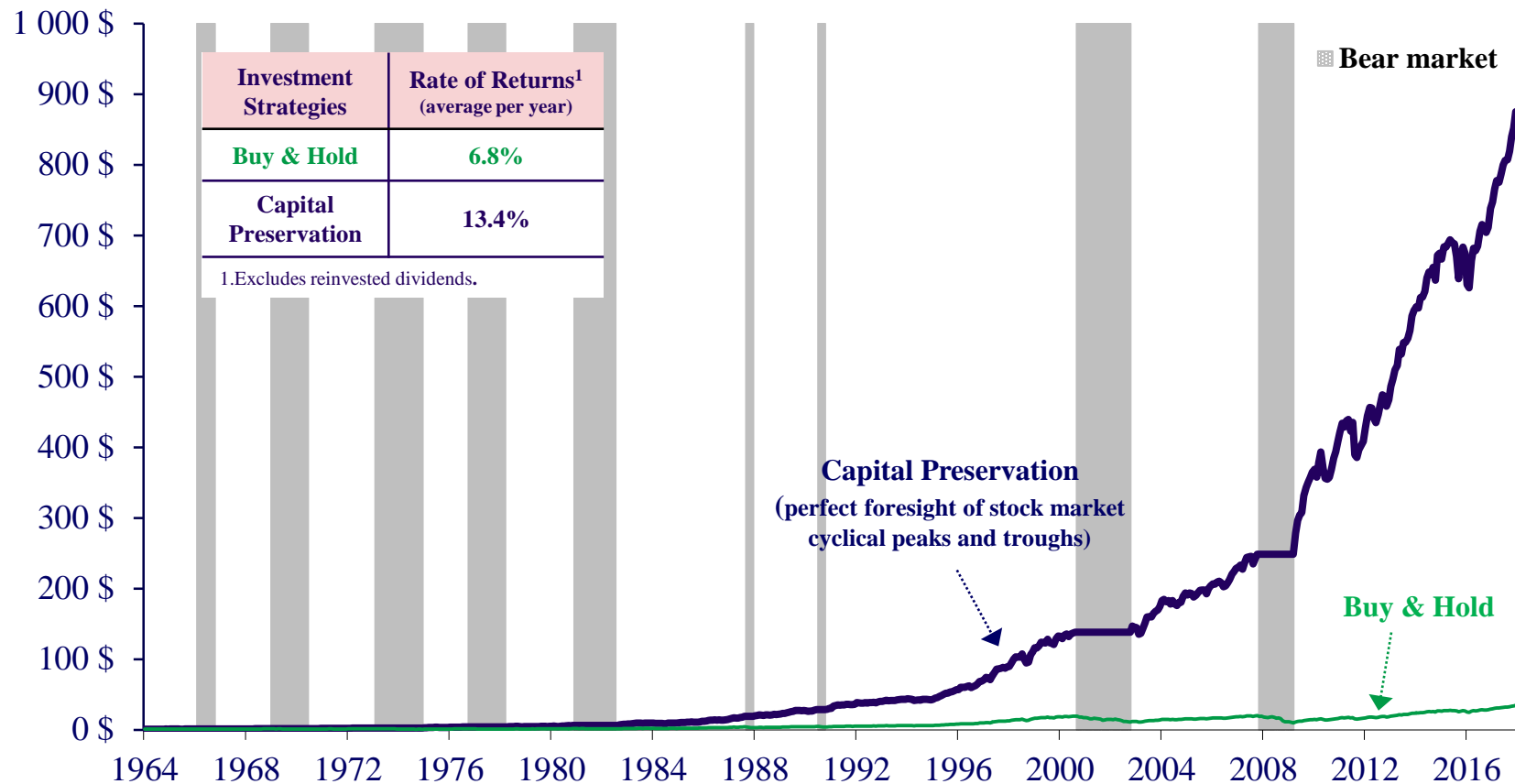
1. Official chronology from the U.S. National Bureau of Economic Research.

2. Excludes the '+12', which is clearly not a typical relationship of the stock market cycle with the business cycle.



# Investment Strategies, Bear Markets, and Rate of Returns

level



## Investment strategies:

- **Buy & Hold:** Investor buys one share of \$&P 500 index in January 1964 for \$1.00 and he holds it in bear markets.
- **Capital Preservation:** Investor buys one share of \$&P 500 index in January 1964 for \$1.00 and he switched to cash at exactly stock market cyclical peaks and he switched back to stocks at exactly stock market cyclical troughs.



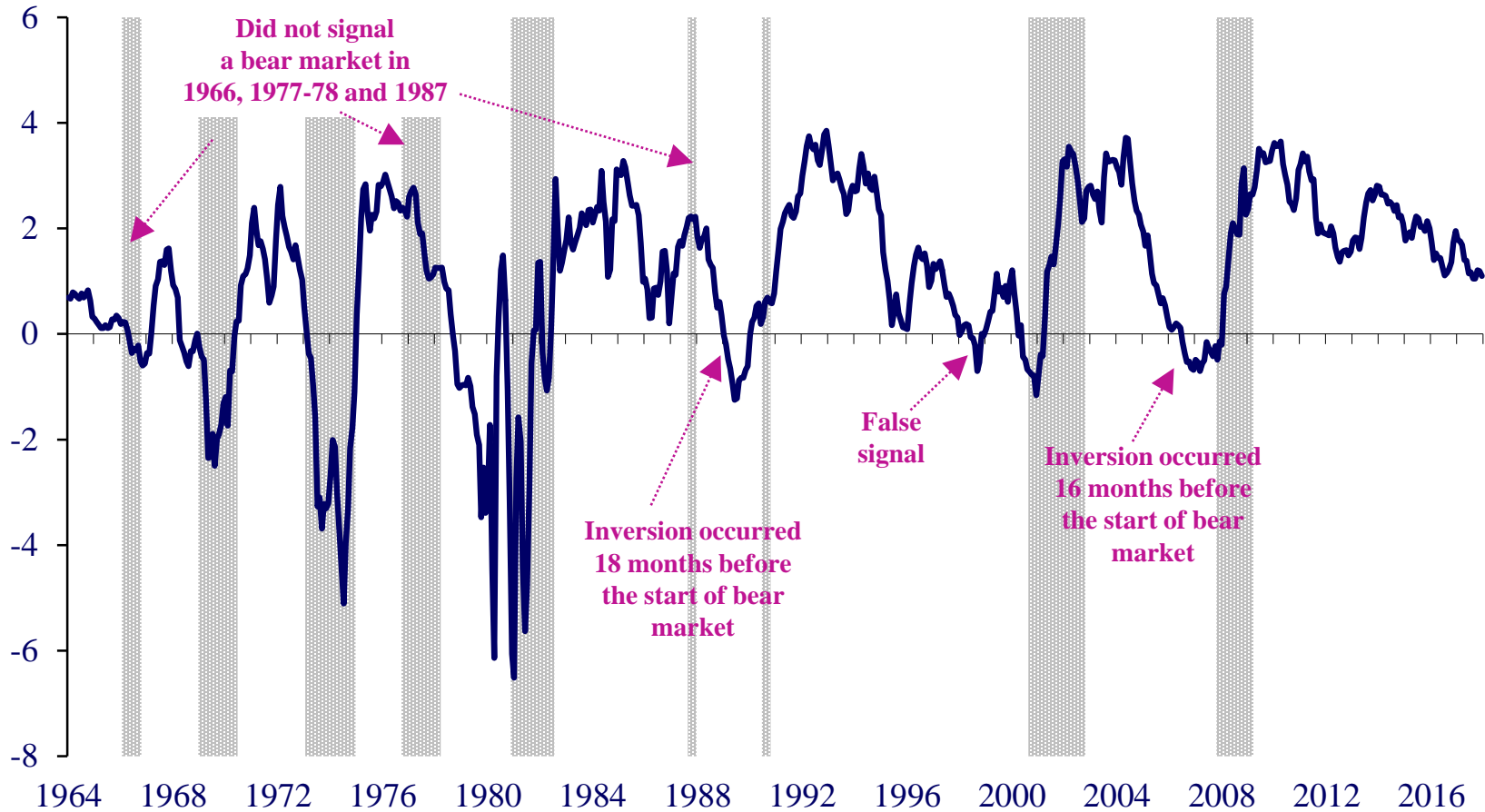


- **Challenge**: Assess the risk of entering a bear market to maximize capital preservation and leaving a bear market to maximize opportunities.
  
- **Tools/Data Available to Individual Investors and Portfolio Managers**:
  1. **Fundamental Analysis**: Earnings and profits cannot provide signs of a reversal to a bear or bull market. They are lagging indicators of the stock market cycle and (at best) coincident indicators of the business cycle.
  2. **Technical Analysis**: Cannot succeed in predicting the reversals to bear or bull markets because most technical indicators take into account only the price and lags current data.
  3. **Bear Market Indicators**: Popular (and publicly available) indicators of reversals to bear or bull markets are:
    - Yield curves (long-term minus short-term interest rate): inversion tends to precede bear markets
    - PMI (manufacturing) and NMI (non-manufacturing) indicators (from the U.S. Institute of Supply Management): provide timely readings on the current state of the business cycle



# U.S. Yield Curve and Bear Markets

per cent

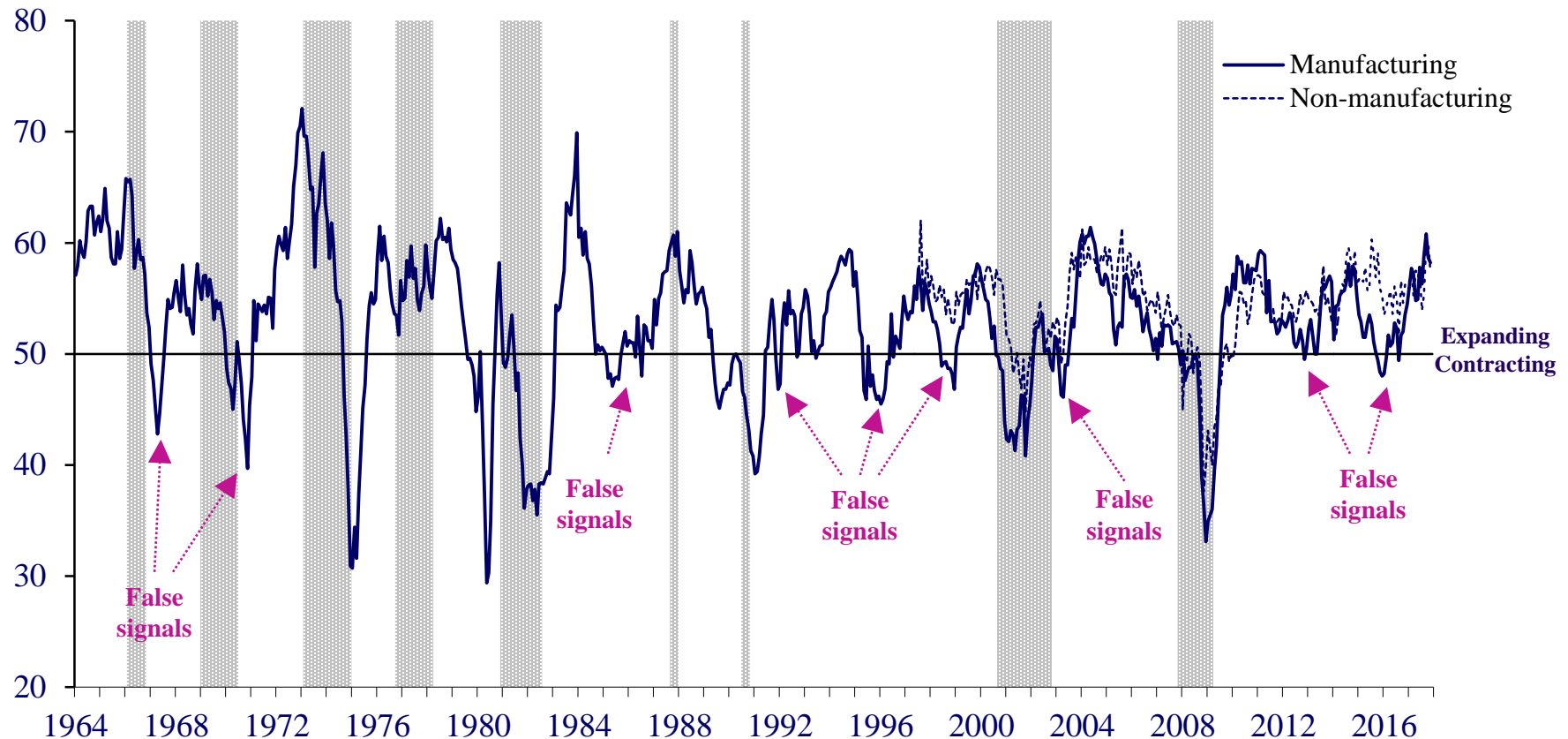


Source: Federal Reserve Bank of St-Louis Fred database. The yield curve is defined as the U.S. 10-year treasury constant maturity minus the U.S. federal funds rate. Last data point is December 2017. The shaded areas represent bear markets.



# U.S. manufacturing PMI and U.S. non-manufacturing NMI Indicators and Bear Markets

(level)



Source: U.S. Institute of Supply Management. Last data point is December 2017. The shaded areas represent bear markets.



# **Forecasting the Stock Market Cycle in the U.S.: Key Features of the Model**



## Key Features of the Model

- **Input into the model:** Past and current information from a number of economic and financial indicators, such as:
  - A (proprietary) index of U.S. overall economic conditions
  - U.S. unemployment rate
  - U.S. long-term and short-term interest rates
  - U.S. price-earning ratio
  - U.S. consumer confidence
  - U.S. inflation rate
  - World commodity prices.
  
- **Output of the model:** Estimate of the probability of entering or leaving a bear market
  
- **Forecast horizon:** Two months
  
- **Forecast frequency:**
  - Monthly (with probabilities calculated at the start of the month)
  - Daily & weekly when U.S. overall economic conditions are deteriorating



## Key Features of the Model

- **Threshold to signal a reversal in the stock market:**
  - 50 per cent.
  
- **Predicted outcome for the stock market:**
  - When a bull market exists, the model predicts a reversal to a bear market if the probability is equals to or exceeds 50%. Otherwise, the model predicts the continuation of bull market.
  
  - When a bear market exists, the model predicts a reversal to a bull market if the probability is equals to or falls below 50%. Otherwise, the model predicts the continuation of the bear market.

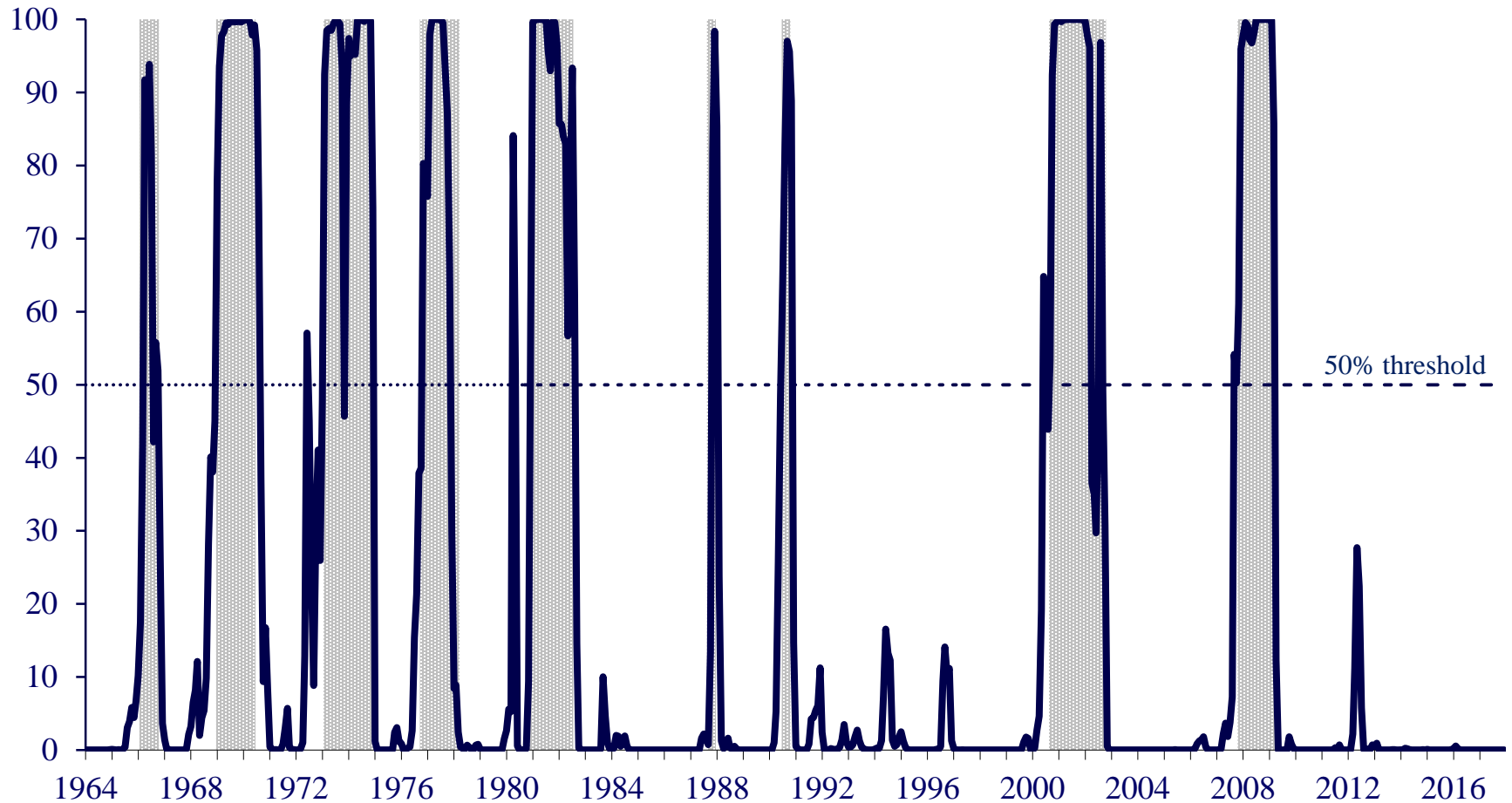


**Forecasting the  
Stock Market Cycle in the U.S.:  
Historical Performance in Predicting  
Bear and Bull Markets**



## Probability for the S&P 500 of Being in a Bear Market

(probability, in %)



Source: The Forecasting Advisor (probability). In-sample probabilities from the one-month ahead probit model. Last data point is December 2017. The shaded areas represent bear markets.





## Historical Performance of the Model in Predicting Bull and Bear Markets in the U.S.

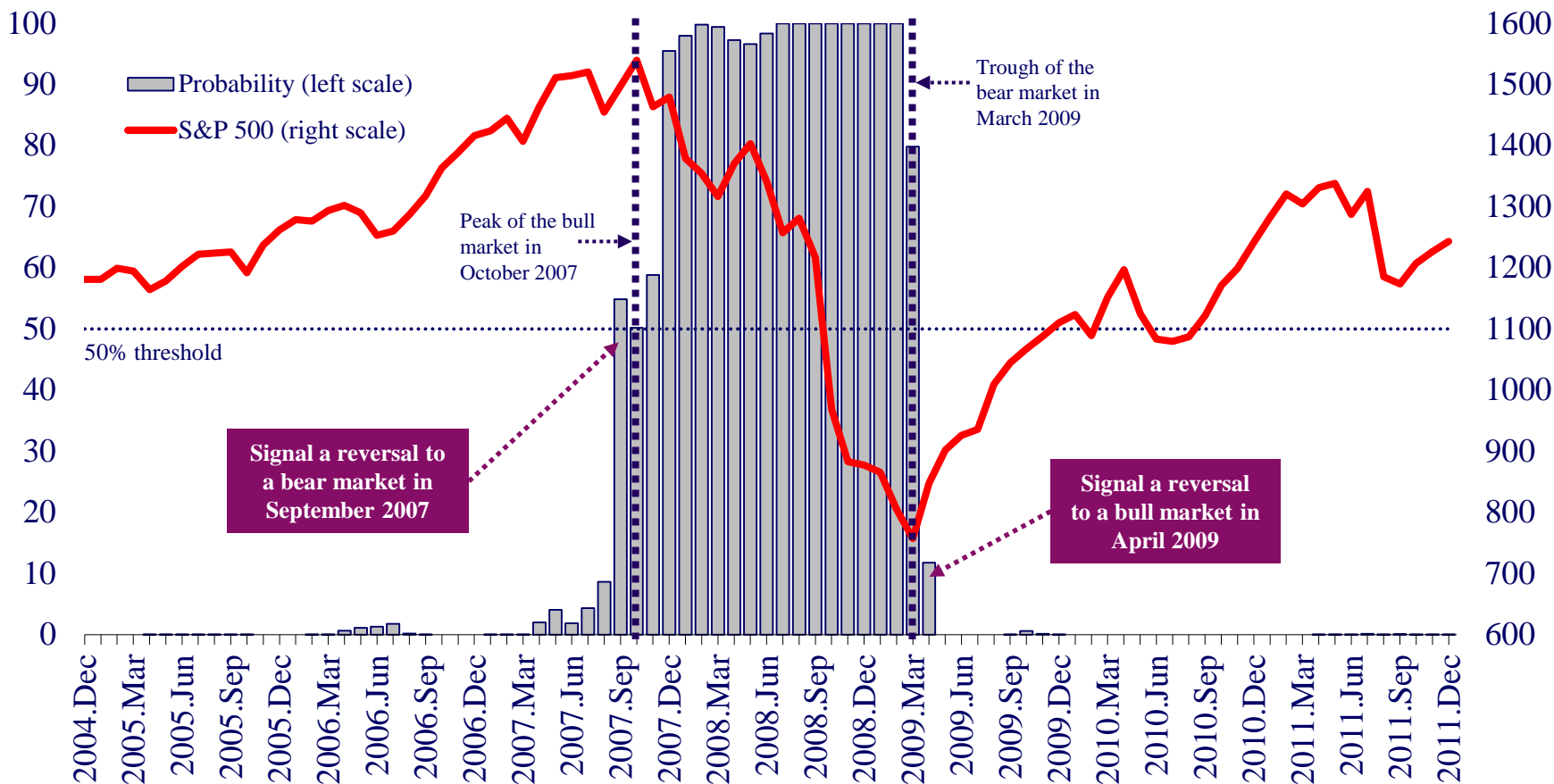
Actual start of the bear market	Signal of a reversal to a bear market	# of months before (-) or after (+) the actual start of a bear market
Feb. 1966	April 1966	+2
Jan. 1969	Dec. 1968	-1
Feb. 1973	Jan. 1973	-1
Oct. 1976	Nov. 1976	+1
Dec. 1980	Dec. 1980	0
Sep. 1987	Nov. 1987	+2
July 1990	June 1990	-1
Sep. 2000	June 2000	-3
Nov. 2007	Sep. 2007	-2
Average		-0.3 month

Actual start of the bull market	Signal of a reversal to a bull market	# of months before (-) or after (+) the actual start of a bull market
Nov. 1966	Aug. 1966	-3
July 1970	Sep. 1970	+2
Jan. 1975	Jan. 1975	0
April 1978	Dec. 1977	-4
Aug. 1982	Sept. 1982	+1
Jan. 1988	Feb. 1988	+1
Nov. 1990	Dec. 1990	+1
Nov. 2002	Avril 2002	-7
April 2009	April 2009	0
Average		-1.0 month



# Probability for the S&P 500 Index Being in a Bear Market: Episode of 2007-2009

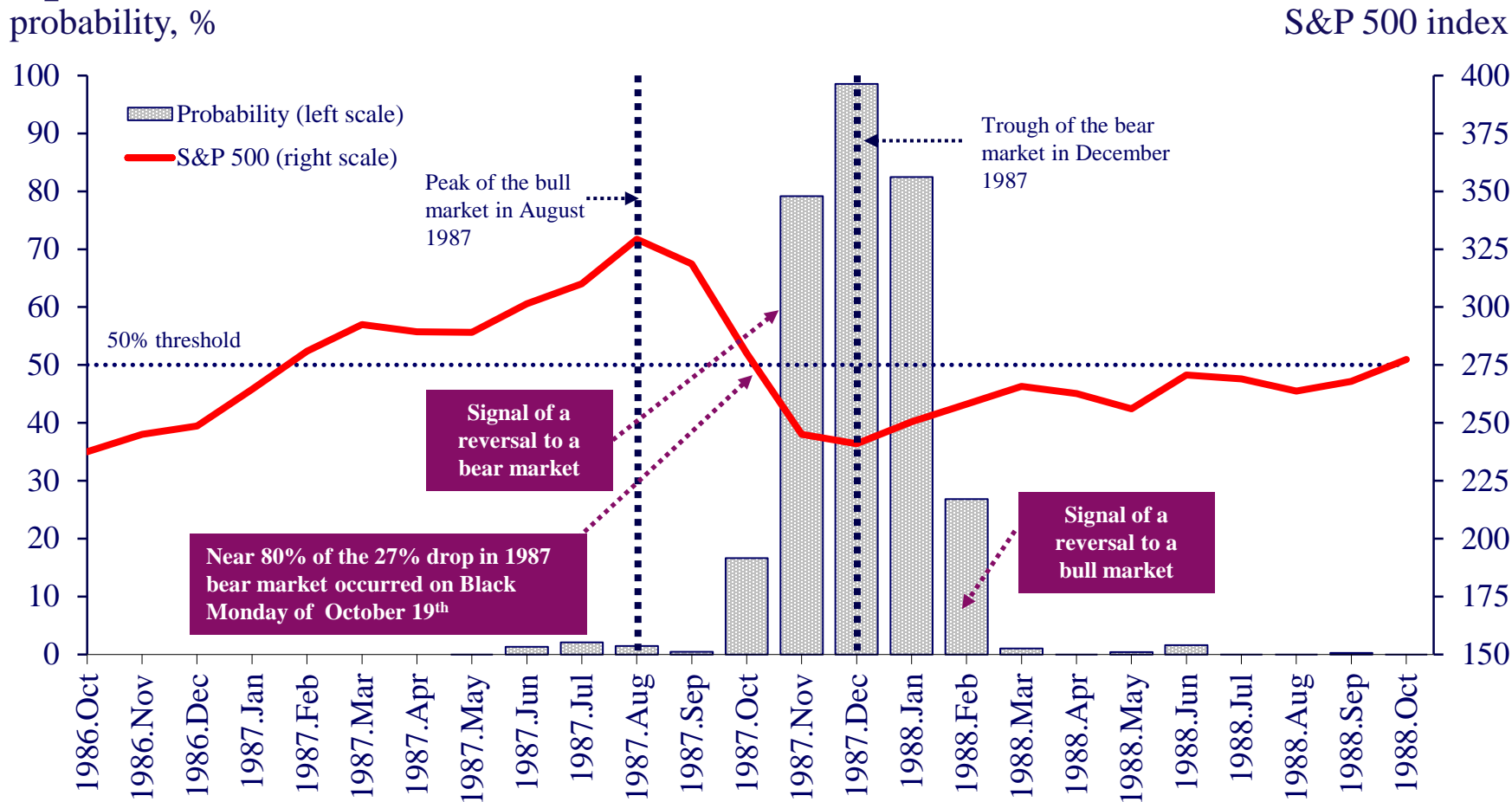
probability, %



Sources: Federal Reserve Bank of St-Louis Fred Database (S&P 500) and The Forecasting Advisor (probability). The in-sample probabilities come from the one-month ahead probit model.



# Probability of the S&P 500 Index Being in a Bear Market: Episode of 1987



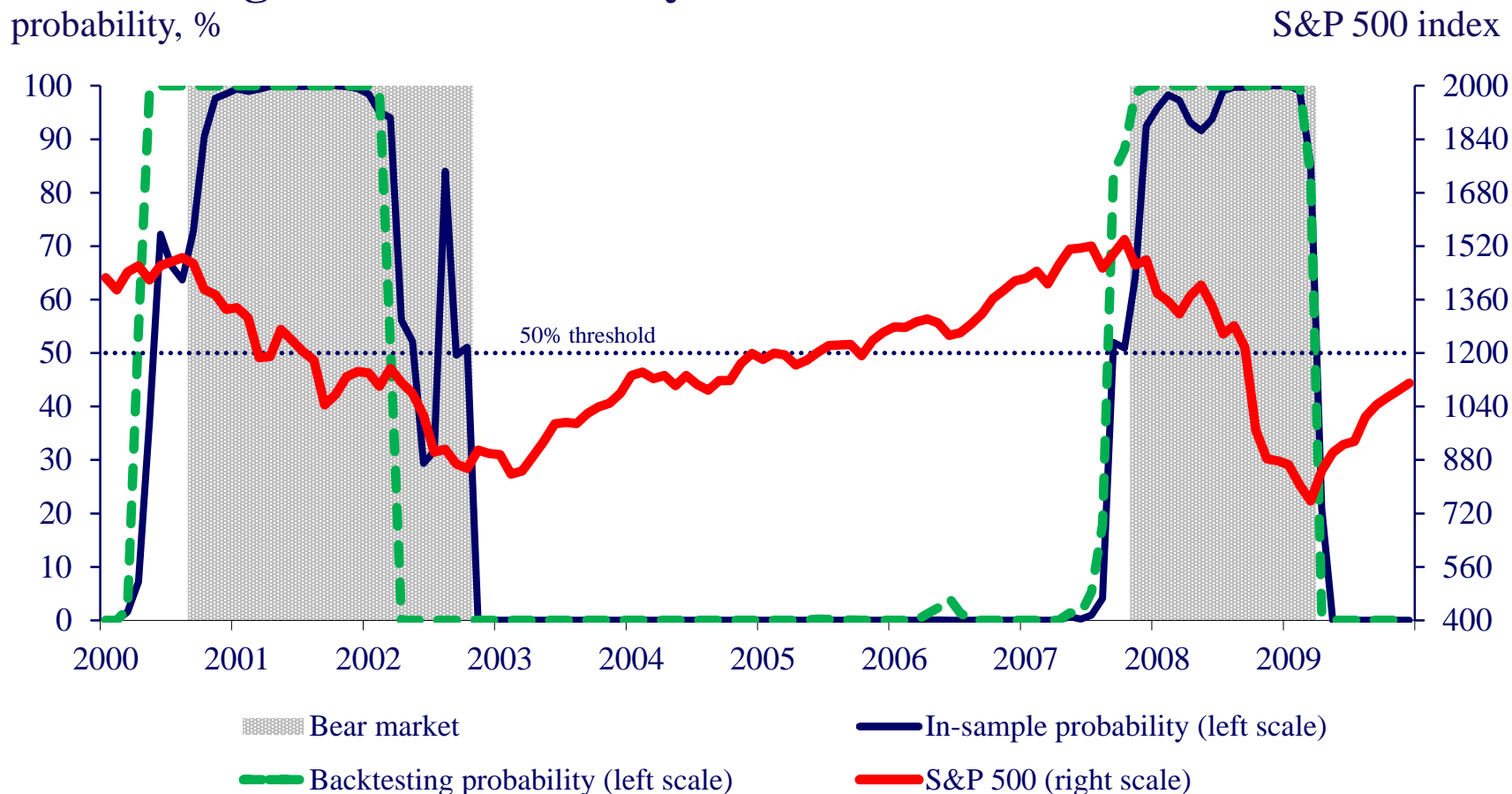
Sources: Federal Reserve Bank of St-Louis Fred Database (S&P 500) and The Forecasting Advisor (probability). The in-sample probabilities come from the one-month ahead probit model.



# **Forecasting the Stock Market Cycle in the U.S.: Backtesting Test**



## Probability of the S&P 500 Index Being in a Bear Market: Backtesting Test from January 2000 to December 2009



Sources: Federal Reserve Bank of St-Louis Fred Database (S&P 500) and The Forecasting Advisor (probability). The probabilities are calculated actual data for the explanatory variables and coefficients of the model estimated from 1964 to 1999.



# **Forecasting the Stock Market Cycle in Canada: Chronology of Bull and Bear Markets**



## S&P/TSE Index and Bear Markets

(level)





## Performance of the S&P/TSE Index in Bull Markets

<b>Bull Markets<sup>1</sup></b>		<b>Duration (in months)</b>	<b>Increase (in %)</b>
<b>Start</b>	<b>End</b>		
July 1970	October 1973	40	63
December 1974	November 1980	71	188
July 1982	July 1987	61	195
December 1987	August 1989	21	35
November 1990	April 1998	90	149
September 1998	August 2000	24	103
October 2002	May 2008	68	138
March 2009		106 <sup>2</sup>	100 <sup>2</sup>
<b>Average</b>		<b>60</b>	<b>121</b>

1. There are no official chronology for Canadian stock market cycle. The chronology for the bull markets is the chronology reported in the economic and financial literature.
2. Until December 2017.





## Performance of the S&P/TSE Index in Bear Markets

Bear Markets <sup>1</sup>		Duration (in months)	Decline (in %)
Start	End		
June 1969	June 1970	13	-28
November 1973	December 1974	14	-37
December 1980	June 1982	19	-43
August 1987	November 1987	4	-26
September 1989	October 1990	14	-23
May 1998	August 1998	4	-28
September 2000	September 2002	25	-45
June 2008	February 2009	9	-45
Average		13	-34

1. There are no official chronology for the Canadian stock market cycle. The chronology for the bear markets is the chronology reported in the economic and financial literature.



# **Forecasting the Stock Market Cycle in Canada: Key Features of the Model**



## Key Features of the Model

- **Input in the model:** Past and current information from a number of economic and financial indicators, such as:
  - Index of leading economic indicators for Canada
  - Canada interest rates
  - Index of U.S economic conditions
  - Index of leading economic indicators for Asian economies
  - World oil prices
  
- **Output of the model:** Estimate of the probability of entering or leaving a bear market
  
- **Forecast horizon:** Two months
  
- **Forecast frequency:**
  - Monthly (with the probabilities calculated at the start of the month)
  - Daily & weekly when U.S. overall economic conditions are deteriorating



## Key Features of the Model

- **Threshold to signal a reversal in the stock market:**
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**Forecasting the  
Stock Market Cycle in Canada:  
Performance of the Model in Predicting  
Bull and Bear Markets**

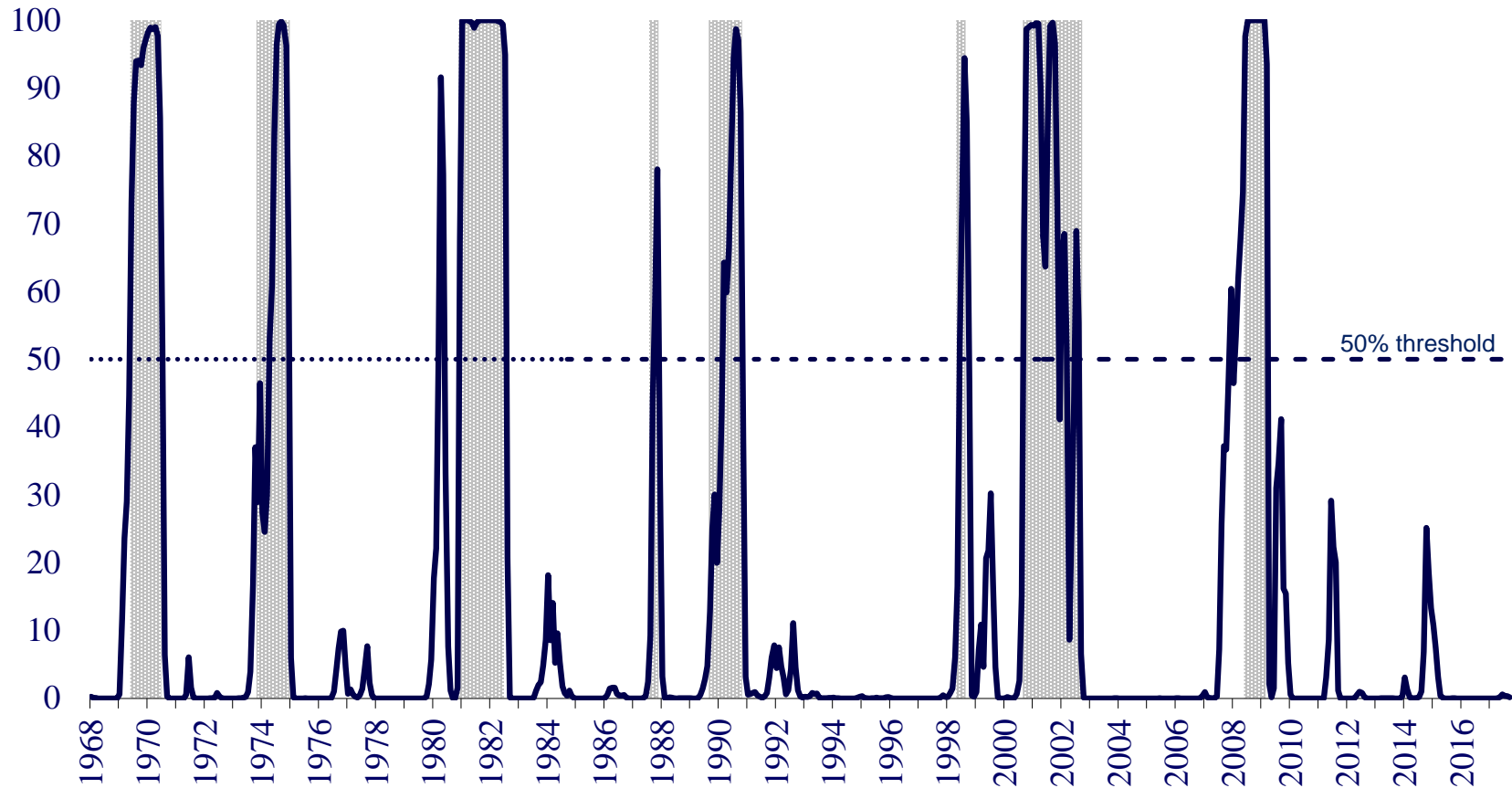


## Performance of the Model in Predicting Bear and Bull Markets

- In-sample results:
  - ✓ Prediction of all the reversals of the S&P/TE index over the past 50 years.
  - ✓ On average, the model signals a reversal to a bear market with a lag of one month with respect to the actual start of the bear market.
  - ✓ On average, the model signals a reversal to a bull market with a lead of 0.3 month with respect to the actual start of the bull market.



## Probability of the S&P /TSE Index Being in a Bear Market (probability, %)



Sources: Statistics Canada (S&P/TSE index) and The Forecasting Advisor (probability). The in-sample probabilities come from the one-month ahead probit model. Shaded areas represent the bear markets.



## Performance of the Model in Predicting Bear and Bull Markets in Canada

Actual start of the bear markets	Signal of a reversal to a bear market	# of months before (-) or after (+) the actual start of the bear market	Actual start of the bull markets	Signal of a reversal to a bull market	# of months before (-) or after (+) the actual start of the bull market
June 1969	May 1969	0	July 1970	August 1970	+1
Nov. 1973	April 1974	+5	Jan. 1975	Jan. 1975	0
Dec. 1980	Dec. 1980	0	July 1982	August 1982	+1
August 1987	Oct. 1987	+2	Nov. 1987	Dec. 1987	0
August 1989	March 1990	+6	Nov. 1990	Nov. 1990	0
June 1998	July 1998	+1	Sep. 1998	Oct. 1998	+1
Sep. 2000	Sept. 2000	0	Oct. 2002	Sept. 2002	-6
June 2008	Dec. 2007	-6	March 2009	April 2009	+1
Average		+1 month	Average		-0.3 month

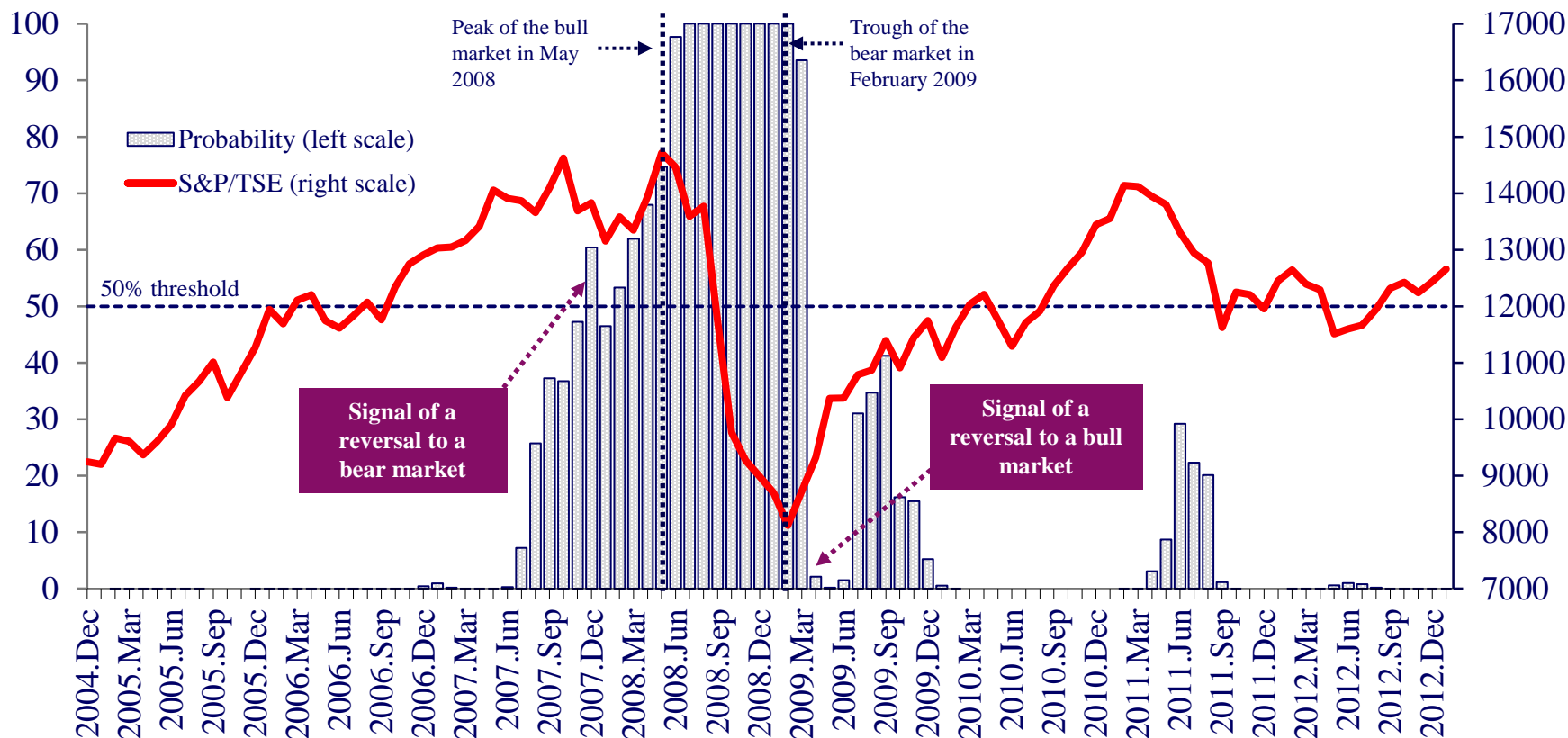




# Probability of the S&P/TSE Index Being in a Bear Market: Episode of 2008-2009

(probability, %)

(S&P /TSE index)



Sources: Statistics Canada (S&P/TSE index) and The Forecasting Advisor (probability). The in-sample probabilities come from the one-month ahead probit model.



**Thanks!**