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Neural Networks and the Financial Markets

Predicting, Combining and Portfolio Optimisation

Springer

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British Library Cataloguing in Publication Data
Neural networks and the financial markets : predicting,
combining and portfolio optimisation. - (Perspectives in
neural computing)
1.Rate of return - Computer simulation 2.Rate of return -
Forecasting 3.Neural networks (Computer science)
I.Shadbolt, Jimmy II. Taylor, John, 1931-
332.6

Library of Congress Cataloging-in-Publication Data
Neural networks and the financial markets : predicting, combining, and portfolio optimisation / Jimmy Shadbolt and John G. Taylor (eds.).
p. cm. -- (Perspectives in neural computing)
Includes bibliographical references and index.
ISBN 978-1-85233-531-1 ISBN 978-1-4471-0151-2 (eBook)
DOI 10.1007/978-1-4471-0151-2
1. Neural networks (Computer science) 2. Finance--Data processing. I. Shadbolt, Jimmy, 1951- II. Taylor, John Gerald, 1931- III. Series.
QA76.87 .N4749 2002
006.3'2--dc21 2002067024

Perspectives in Neural Computing ISSN 1431-6854

http://www.springer.co.uk

Originally published by Springer-Verlag London Limited in 2002

Typesetting: Ian Kingston Editorial Services, Nottingham, UK

34/3830-543210 Printed on acid-free paper SPIN 10842959

Preface

This is a book about the methods developed by our research team, over a period of 10 years, for predicting financial market returns.

The work began in late 1991, at a time when one of us (Jimmy Shadbolt) had just completed a rewrite of the software used at Econostat by the economics team for medium-term trend prediction of economic indicators. Looking for a new project, it was suggested that we look at non-linear modelling of financial markets, and that a good place to start might be with neural networks.

One small caveat should be added before we start: we use the terms "prediction" and "prediction model" throughout the book, although, with only such a small amount of information being extracted about future performance, can we really claim to be building predictors at all? Some might say that the future of markets, especially one month ahead, is too dim to perceive. We think we can claim to "predict" for two reasons. Firstly we do indeed predict a few per cent of future values of certain assets in terms of past values of certain indicators, as shown by our track record. Secondly, we use standard and in-house prediction methods that are purely quantitative. We allow no subjective view to alter what the models tell us. Thus we are doing prediction, even if the problem is very hard. So while we could throughout the book talk about "getting a better view of the future" or some such euphemism, we would not be correctly describing what it is we are actually doing. We are indeed getting a better view of the future, by using prediction methods.

The initial results looked very promising, and we soon had a small team working on one-month-ahead bond prediction. Late in 1992 we were given funds to manage on the basis of those predictions. Over the nine years since then we have continuously managed funds and consistently outperformed our benchmark (the Salomon Index). The team came to be known as the *NewQuant* Team, and the product the *NewQuant* Product. References are made throughout the book to both as *NewQuant*.

The contributors to this book have all contributed directly to our work, either as researchers in our team or as consultants on specific aspects.

We would like to thank them heartily for their efforts.

Others who have contributed to our work (but not the book) in more or less chronological order are Paul Refenes, Magali Azema-Barak and Ugur Bilge (who got us up to date with neural networks), John Coyne (who worked with genetic algorithms for input selection and developed our

first network integration models), Drago Indjic (who developed, amongst other things, a method that turned out to be the same as Leo Breiman's Bagging), Dario Romare (linear modelling and wavelets), Pano Vergis (PCA, mutual information) and David Chippington (our software backup and system admin). On the way, Brian Ripley kicked our butts and forced some very serious analysis of what we were doing.

Some research directions have been examined and abandoned; some of those will probably be revisited when we have solutions to the problems encountered. Some have taken up to a year to deliver the goods and are part of our toolkit today. In all over 50 person years have gone into our research.

The problems encountered along the way are those due to our living on the edge of randomness. Unlike in most other disciplines, the predictability of our data is marginal – the error bounds are almost as wide as the data variance. We cannot make claims of models fitting data with 90% confidence levels; in fact, we hope only to be consistently a few per cent better than random. The ultimate test of whether our models have value comes only from using them to allocate funds in a portfolio, and here we can make claims to success.

The *NewQuant* process must be considered as a whole, from the economics used for initial input selection, through the quantitative data selection, prediction modelling and model combining, to the portfolio optimisation. No individual model is of use on its own: it is only through the whole process that we can derive benefit.

We would like to close by thanking Charles Diamond, the MD of Econostat, for continued support, allowing the work reported here to be performed.

Jimmy Shadbolt
John G. Taylor

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