

## SEMICONDUCTOR MARKET FLUCTUATION INDICATORS AND RULE DERIVATIONS USING THE ROUGH SET THEORY

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**ABSTRACT.** *Semiconductors are the most important components in most electronic systems. The semiconductor market exhibits highly cyclical behavior, which has become one of the major impact factors for world economic performance. Meanwhile, the wealth of the leading countries in the semiconductor industry, e.g. South Korea and Taiwan, depends highly on the semiconductor market situation. Although important, very few studies have focused on deriving general indicators or rules for predicting semiconductor market fluctuations. Instead, existing research focuses mainly on discussing specific reasons for explaining one or a few past semiconductor industry business cycle(s). Such rules of thumb, which are intended to serve as foundations for policy definitions, strategic planning and investment decisions, are complex and cannot be easily followed to predict future semiconductor market fluctuations. On the other hand, a rule-based forecasting (RBF) framework will be very helpful for real world managers' and policy makers' applications. Thus, the purpose of this research is to derive a set of general rules for predicting future semiconductor market fluctuations. Based on historical data, a set of basic indicators serving as inputs for algorithms developed based on the rough set theory (RST) will first be summarized using the brainstorming approach followed by semiconductor industry experts. Then the fluctuations of the basic indicators from 1978 to 2004 will be transformed into seven levels of linguistic variables from high growth (HG) to high recession (HR). After the transformation of growth rates into linguistic variables, a set of general rules for predicting future semiconductor market industry fluctuations will be derived using RST. Finally, general rules and a set of indicators are presented for government policy definition, industry strategic planning, investment analysis and so on. As a result, 18 indicators and 12 rules are derived. The results demonstrate that when the semiconductor capital spending grows strongly or the European Union (EU) Gross Domestic Product (GDP) grows strongly when the crude oil price remains unchanged, the semiconductor market will grow strongly. Meanwhile, when the electronic system production declines severely, the semiconductor market will also be in a severe recession.*