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An Iterative Enterprise Group Algorithm

Abstract

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For statistical as well as for legal purposes it is vital to have a solid understanding of group membership of firms and of the roles that human controllers play in this context. Major focus in Statistical Business Registers is laid on the issue of the interconnectedness of the various forms of legal entities amongst each other as well as on their links to human owners and controllers.

The paper describes an algorithmic methodology to derive groups of enterprises for a given set of firms and people, provided that only one-to-one-relationships are known.

It, furthermore, explores common types of links such as ownership, capital shares, other controlling relationships and manually evaluated control and how to prepare the data and the algorithm to combine them for statistical use. It also deals with the problems arising from such connections and their combinations like dealing with circular ownerships and contradictory information.

Typical solutions to this problem are recursive by nature. They tend to have a rather long runtime and either carry out the same operations multiple times or have to use extra storage for caching information. This is impractical - in particular - when working with large sets of data and large groups for which business group involvement needs to be kept up to date, which in general is the task that business registers have to carry out.

The proposed methodology uses an iterative approach, which converges towards the final result in very few steps without either of these problems. It was motivated by mathematical induction, a simple, yet, very powerful proof technique, and uses the property that, if properly prepared, each one-to-one-relationship already represents a group of a certain kind itself, and that the iterative addition of further members to such a group does only add to that group but cannot change another legal member's membership status.

This method is currently in use in the Austrian Statistical Business Register as well as in the Austrian Beneficial Ownership Register.