Financial markets have undergone major changes in recent years. Large stock exchanges with wildly gesticulating traders and stockbrokers have long been a thing of the past.

These days, the image that pops up when speaking of a stock exchange is probably a huge, gray server room with unbelievable amounts of data being processed in fractions of seconds. Technological progress has brought us automated algorithms and computer systems replacing floor trading, in which stockbrokers and exchange traders conclude transaction by shouting or gesturing. For instance, the largest German stock exchange, the Frankfurt Stock Exchange, abolished floor trading already on 23.5.2011, moving all trading activities to a fully electronic trading system called XETRA. This electronic stock exchange XETRA is accessible from anywhere in the world, with market participants placing their orders digitally. The algorithm underpinning the trading system then collects all orders in a central and open order book and executes orders that correspond to each other in terms of price.

Once electronic trading venues and the automated execution of orders became the norm, this also changed the trading behavior of market participants. While it used to be laborious to execute orders, financial institutions and companies now use this technological progress to their advantage. Buy and sell orders are often no longer executed by a human being but based on programmed, fixed rules by an independently acting trading algorithm. The advantage of such trading algorithms is the system’s speed and rationality. An efficiently designed trading system can process new data, commercial news and other information from the stock exchange’s order book in microseconds (one millionth of a second) and make a decision based on it. The trading algorithm has no emotions and strictly follows the pre-programmed rules.

Because algorithms are so much faster than humans, this kind of exchange trading has become very popular in recent years. Already in 2012, algorithmic trading accounted for about 85% of all trading volume (www.experfy.com/blog/the-future-of-algorithmic-trading). Having said that, algorithmic trading is a rather broad term, which has various more specific sub-areas. The following types of automated securities trading can be distinguished:

- **Brokerage**
  Is the automated processing of an order placed by a client through a brokerage firm or the splitting of large trading orders into smaller ones in order to minimize the influence on the market.

- **Slower Algorithmic Trading**
  These algorithms act independently in the capital market based on pre-defined rules. The speed of the execution of an order is of lesser importance. For instance, such algorithms are used in the monthly rebalancing of long-term portfolios. However, as in brokerage, such algorithms can also be
• **High-Frequency Trading (HFT)**
  Here, the speed of the trading algorithm is of the utmost importance. The point here is mostly to exploit temporary inefficiencies on the market. Such algorithms are for example used for arbitrage trading or to make use of short-term momentum-based strategies.

More and more companies that are not in the energy or financial sector are discovering the advantages of automated trading systems. In comparison to 2015, 2% more corporations are using algorithmic trading for FX trading, bringing the number up to 10% in 2016 ([www.euromoney.com/article/b13k0rb4qz9d4t/corporates-drive-impressive-growth-in-fx-algo-use](http://www.euromoney.com/article/b13k0rb4qz9d4t/corporates-drive-impressive-growth-in-fx-algo-use)). For corporations with a trading volume exceeding USD 50m, algorithmic order execution is as high as 24% for FX trading. The majority of this relates to FX spot trades. The algorithms used most likely fall into the category of Slower Algorithmic Trading. The speed with which the orders are executed is important but in comparison to the ones used by HFT traders, rather slow.

Especially two types of algorithms are popular in corporations and their Treasury departments. On the one hand, it is algorithms that break down large orders into smaller ones. These are called trade execution algorithms. Especially very large corporations frequently require this for larger financial transactions. Entering an order that is large in relation to the order book would have a strong impact on the market. The price of the financial instrument in question would rise or fall due to the high buying or selling interest. Moreover, trading participants could take advantage if such a large order placed in the market were observable and place an order at a slightly better price, knowing that there is market participant backing it up with a large order. The three most popular types of trade execution algorithms are the Time Weighted Average Price (TWAP), the Volume Weighted Average Price (VWAP) and the Percent of Volume (PoV) ([blazeportfolio.com/blog/introduction-to-trade-execution-algorithms-2](http://blazeportfolio.com/blog/introduction-to-trade-execution-algorithms-2)).

The Time Weighted Average Price algorithm splits up the order into smaller orders of equal size, trading these over a predefined time period. With the Volume Weighted Average Price Execution trading system, not only time is of the essence but also the traded volume of a financial instrument. The historic trading volume is also taken into account when calculating the order volume. If a greater trading interest can observed in contrast to the historical trading volume, the algorithm can also trade larger portions of the order. The trading volume is also of importance with the Percent of Volume algorithm. With this method, the participation rate of the algorithm in the volume traded on the stock exchange in a financial instruments is determined. With a trading volume of 1,000 shares per minute and a fixed participation rate of 1%, the algorithm trades 10 shares. In practice, these basic algorithms are heavily tweaked. Often, a certain price spread is programmed which means that the algorithm places an order only if the price lies within this spread. Since there are no limits to what could be programmed into an algorithm, there are a large number of other possibilities to adapt such basic concepts.

The other type of algorithm often used by Treasury departments are trading systems that are tied into various trading venues in order to allow the execution at the best price during a trade. By including various stock exchanges, the prices of certain financial instruments can be compared, allowing for a financial transaction to be carried out at the best market price.

Experts estimate that already 60% of all DAX corporations use such algorithms (Algorithmen im FX-Handel bleiben umstritten, DerTreasurer). The following advantages make using automated trading systems so interesting for large industrial corporations.

• As already described above, large buy and sell orders can be split into smaller orders to reduce market impact, thus being able to get a better execution price. Moreover, having the algorithm trade on several trading venues makes for a greater market liquidity.

• Traders can process more orders by using algorithms.

• Placing orders automatically can bring down the error rate. Moreover, algorithms are easy to monitor, thus enabling benchmarking such as for the quality of the order placement. (Algorithmic FX trading an “inevitable endpoint” for treasurers)
- Algorithms can easily be improved constantly without having to take them off a market. Once one becomes familiar with an easy trading system, it may be developed further in step with technological progress and also used for other areas.

Companies not from the financial sector use algorithms mainly for their FX trading. The reason for this is the copious foreign business of large Swiss corporations and the resulting wish to hedge against currency risks. Oftentimes, this makes for very large orders, which is another reason why algorithms that place orders over a certain period of time and distribute them across different stock exchanges are so popular. It is generally banks and larger financial institutions that offer such algorithms. These get together with the corporation to determine which type of algorithm would make sense for the corporation and which adjustments have to be made to existing algorithms. Already existing algorithms could also be used on the trading platform 360T. Various banks offer their trading systems for use there.

Unfortunately, there are no reliable sources to what extent automated trading systems are used in other asset classes traded by treasury departments. They could also be used for commodities trading or for companies concluding a large number of forward transactions.

Having said all this, using algorithms is still the domain of large corporations. Small companies’ trading volume is generally very small and have no influence on market pricing. Because of this, their trades can simply be placed on the stock exchange and do not need to split into smaller orders. Corporations are also increasingly critical of the dependency on banks this creates when using algorithmic trading systems (Algorithmen im FX-Handel bleiben umstritten, DerTreasurer).

However, technological progress has whet the appetite for more. For instance, it would be interesting to have an algorithm communicate with the Treasury Management System and analyze the flow of transactions. Should hedging be required, the algorithm would place the order by itself. Such algorithms would then become attractive also for smaller companies. However, it remains to be seen to what degree such or similar algorithms will be used by companies in the future.
Liquidity planning ensuring solvency at all times remains a hot topic for Swiss treasury departments, representing an essential aspect of cash and liquidity management.

Usually, corporate Treasury departments use the approach of direct liquidity planning. For this, budgeted operational items are calculated separately, such as cash receipts from turnover, payments to vendors or payroll. Current cashflows determined according to the direct method are often required for developing planning approaches, extrapolations, reports and optimizations.

**Background: Realistic Mapping of Historical Cashflows**

The determination of historical cashflows has two main goals: on the one hand, an accurate statement of actual figures and the resulting transparent cashflow accounting helps to assess the accuracy of the liquidity planning. Without them, it becomes hard to verify anomalies and trends. The effort it takes to reconcile bank statements with underlying business transactions is akin to the work of a detective.

On the other hand, a detailed and up-to-date statement of actual figures with a value date display can form a starting point for liquidity planning using extrapolation methods or statistical forecasting models. In doing so, historical cashflows can be extended into the future using driver-based extrapolation calculations. Extrapolation approaches also offer a starting place to introduce a higher degree of automation, for instance, by introducing predictive analytics. Of course, extraordinary effects, such as upcoming investments still have to be considered individually.

If the company does not have an up-to-date statement of actual figures, the Treasury department often borrows from its neighboring department the traditional controlling data. Complementing the planning like this makes sense but if controlling data is the only source, this should nonetheless be looked at critically. The trouble is that data coming from Controlling looks at the data from a different perspective, i.e. “what should be” as opposed to Treasury’s “what will be”. For example, an aggressive P&L planning could result in a liquidity planning that is too risk-prone. As a result, the company will require short-term capital that can only be covered at a certain expense. So how can Treasury build a realistic and up-to-date cashflow statement?

**The Challenge: Generating an Up-to-Date Cashflow Statement in a Heterogeneous IT Environment**

Many companies use extracts from bank accounts that they sift through according to rules, such as document text or business transaction code. However, this data is often not informative enough: for instance, bank account extracts do not differentiate between OPEX and CAPEX.
The additional granularity needed may be obtained by using tools, such as the Liquidity Planner (SAP-LP), to analyze the current cashflow based on SAP FI bookings. It generates a current cashflow statement by chain-analyzing accounting vouchers: starting with bank accounts, the tool evaluates bookings and amounts and allocates these to certain liquidity items using the last account assignment. However, not all companies use SAP or they have a very heterogeneous and/or decentralized SAP environment. Such companies should consider alternatives for generating a current cashflow account.

Companies with many data sources would need a tool that is easy to implement in their current system landscape and that is usable across various systems. So-called ETL (Extract, Transform, Load) tools that can be integrated flexibly into the IT architecture and that are capable of bundling data flows from various source systems offer an ideal workaround. Good examples of ETL tools are Pentaho, Talend or Alteryx.

The Remedy: Using ETL Solutions

The challenges that arise due to non-SAP-based or heterogeneous treasury IT landscapes may be circumvented by using an ETL analysis tool that is flexible and works across different systems. After having extracted the data from the relevant source (i.e. any of the conventional database systems or flat files), the data is then cleansed and transformed. The whole thing should be thought of as the stringing together of many macros that are applied to a huge mass of data one after the other.

In a first step, the necessary data is loaded by directly connecting to the source system, e.g. an ERP system. The tool is configured in such a way that it establishes a connection between the individual accounting steps, so that the accounting chains can be traced with the help of the relevant accounting proof. As a result, only the accounting streams that relate to payments are considered. A cashflow item is assigned to each general ledger account so that the account at the opposite end of the accounting chain to the bank account serves as an indicator of the cashflow item.

A classic example for such a voucher chain is: Materials and supplies – Trade payables – Bank clearing – Bank. The analysis starts from the bank account and winds up with the general ledger account Materials and supplies. If this general ledger account is allocated to the liquidity item "Vendor payments", the amount is disclosed in the cashflow statement as such. Further transformation steps make sure that the amount is added or deducted as required. Because of the detailed allocation to general ledger accounts it also becomes possible to make the liquidity items more granular (in this example, "vendor payments" could be broken down into payment for raw materials, payment for finished goods, etc.).

This approach mimics SAP-LP functionality. The result at the end of the processing is a modified database. The output could be either a database or a flat file so that further processing is possible, for example in a reporting tool.

ETL tools such as Alteryx are especially handy for a data transformation across systems because it enables complex data processing steps without any programming knowhow. The presentation and application of Alteryx takes place with user-friendly user interfaces. Quality is ensured at all times with transparent processing steps. Even large masses of data can easily be crunched with this approach. Task controls help to highly automate the data processing. Hence, there is no more excuse for not doing a regular data extract.

The Result: Liquidity Planning based on Data Output

The output of the ETL process can now be used as consistent source for an up-to-date cashflow in the course direct liquidity planning. The extrapolation of the current numbers may serve as extension of an existing bottom-up planning approach, where planning input from different planning units is aggregated (e.g. Purchasing, Sales). This top-down expansion represents the possibility of a reference value and thus provides the possibility to validate and if necessary, adjust the procedure.

Extrapolation is a projection of the actual figures using historical payment curves. For instance, it is possible to deduce budget values for individual liquidity items by applying foreseeable trends in form
of percentages. Other approaches come from the area of predictive analytics where budget values are forecast using statistical methods, e.g. by using a time series analysis.

The current cashflow analysis serves as the base for a direct liquidity planning and it can be done even without SAP or SAP-LP. By applying ETL tools such as Alteryx, companies not only maintain a high degree of flexibility in regard to source data but also for data processing. This solution is easy and cheap to implement and is low maintenance. In the end, using an ETL tool for a current cashflow analysis is in general neither better nor worse than the use of SAP-LP. However, it offers an interesting alternative for companies without a comprehensive SAP solution or whose IT systems are very heterogeneous.