

# Intelligent Treasury

## The next evolutionary level in Treasury

Finance and Treasury Management Switzerland

With the general push towards digitalization, many companies have made automation, innovation and agility their strategy's guiding principle. Boardrooms are declaring digitalization as a goal, which puts pressure on many corporate departments to contribute to achieving this goal; treasury is no exception. In view of the disruption experienced at the markets and the continuous progress in technology, Treasury 4.0 announced by us in 2015 is now facing a new evolutionary step – Intelligent Treasury.

This is a concept that consists of end-to-end processes, avoids media breaks and intelligently links processes. It enlists the most advanced technologies, such as the support of machine learning and robotic process automation, and is both a prerequisite and the foundation for future evolutions. Our white paper is based on a study made within the Treasury community between October 2019 and January 2020, surveying Treasury departments on how far along they are towards an Intelligent Treasury. The survey's focus was on processes and the organizational setup, the readiness to change within the company and on technology in general. This article would like to give you a quick glance at what moved the respondents, and how their concerns and statements align with our vision of intelligent Treasury departments.

### **Treasury will always have to grapple with new challenges**

However, these cannot always be predicted. The current economically uncertain times triggered by the Coronavirus have shown how important it is to refocus more on Treasury's main areas of expertise:

- knowing how much cash there is and where it is located within the company, together with a reliable forecast on the short-term and mid-term liquidity needs;
- detecting liquidity shortages early on;
- ensuring the company's continuous solvency;
- identifying and mitigating risks.

Beyond that, it is important to design an effective and efficient value chain. An intelligent Treasury department should not only be concerned with reducing manual activities to a minimum but also with maintaining a smooth communication between different systems in the Treasury department's IT landscape. The survey confirms this much: 96% of the respondents intend to better integrate their strategies, processes and systems or migrate these into a single system.

In order to master the ongoing changes, companies require agile methods and transparency. On the one hand, they have to react to a dynamic market environment and on the other hand they need to safeguard the company's economic stability.

### **Clear focus on centralization**

Our study also shows that 89% of the respondents wish to further centralize their treasury activities. The question is less whether to centralize but rather what can and should be centralized. For instance, there is an increased wish to report to Management more frequently and in more detail. There is an expectation that data should be delivered at the push of a button to various stakeholders, let's say, the tax authorities. Decentralized processes cause unnecessary delays in comparison to real-time reporting, which can only be realized with new technologies and the centralization of activities.

Another important aspect is the increase in transparency alluded to earlier. With a centralized approach, the Finance department has an overview of what is happening at headquarters as well as at the local entities. Efforts to coordinate with local contacts are eliminated, which leaves more time to focus on the essentials.

### **Optimizing the IT roadmap and deploying innovative technologies**

Centralization and real straight-through processing depend on the characteristics of the processes and the system landscape. The survey suggests that the highest potential for automated processes lies in payment operations (67%), followed by cash management (58%) and liquidity planning (49%).

With 18%, risk management does not seem to be an area of much priority for automation among treasurers; nonetheless, a look into the future shows interesting development opportunities here as well. Accordingly, the merging of liquidity planning and risk management is becoming increasingly likely and also makes sense. State-of-the-art predictive analytics methods (e.g. time series analyses) could be used to extrapolate plan values, prepare currency-differentiated liquidity planning and automatically determine the global FX exposure.

The advantages are clear. The previously mentioned centralized strategic approach could be expanded even further. At the level of headquarters, a brief check of the reasonableness of the reported data will be sufficient, with tasks involved becoming more process-oriented. This form of data processing in turn provides the advantage of a holistic view of all processes. This means fewer regional Treasury resources are needed.

The investment in new technologies also requires an increasingly closer coordination, communication and collaboration with the IT department. Already today, the departments are cooperating closely with activities dovetailing even more. At one level, this is because the operating department sets requirements for the IT department. At another level, the IT department needs to assess the implementation and feasibility of these requirements correctly, and also act in the role of advisor. Going forward, Treasury will also have to work together with IT as a sparring partner to develop a corporate IT road map in order to connect technology and business in the best way possible.

### **Analytical skills are in demand**

The new technologies discussed above will bolster treasury reporting and treasury analytics. In general, 21% of our survey respondents intend to use analytics in treasury or expand these. This application is only one indication of the continuing digitalization of treasury activities. It will also require a change in the hiring strategy. Treasury employees will have to have better IT knowledge and thus require more training. A majority (84%) indicated that they are already offering training and CPD to their employees today, and that they are expecting to expand this.

What is clear is that this will also affect staff selection: these days, 93% of vacant positions require a combination of relevant expertise and technical affinity. This means that the skill to analyze available data and draw meaningful conclusions from it will become a key hiring criterion. This way, adequate decision-making information is delivered to Management, thus shortening decision-making paths. The focus of activities are therefore bound to shift from data collection and processing to analysis and interpretation.

### **Readiness for change and refocusing on the fundamentals of treasury**

The preliminary conclusions of our Intelligent Treasury survey are the following:

Corporate strategies focus today on what is needed tomorrow. The disruptive change causes constant flux and requires adjustments. According to our survey, the treasury community is quite ready for the change. The possibilities to tackle these changes will involve a variety of technologies. These will revolutionize the treasury market considerably. Apart from the use of analytics, cloud-based TMS solutions, artificial intelligence and robotics process automation will be decisive. It is not only pivotal to have technical aids: having 100% transparency facilitates the decision-making and guarantees a complete process understanding.

Digitalization is important and necessary. The treasury community is more than aware of this fact. The proof is in our study but also in many conversations that we have with our clients every day. Nonetheless, the current situation also shows how important it is to remember the treasury department's core competences: providing the greatest possible transparency regarding the company's liquidity, securing its solvency and providing an adequate risk management.

However, Treasury will have to grapple with digitalization in the medium and long-term. This is why we are providing you with an exclusive preview of our white paper with this article. You will have a more detailed view of the results from our survey as well as our vision of the treasury department of the future - the intelligent treasury - once the white paper has been published, foreseeably in June 2020.

# Super contango in crude oil

## A black swan situation and its repercussions

Finance and Treasury Management Switzerland

### Black Swan Events

The most recent events concerning the raging Corona pandemic have kept the global markets breathless. The preventive measures against the spread of this new virus have inflicted economic repercussions on the gastronomy and hotel business, retailers, automobile producers and airlines. But they are not alone. Commodities traders are also affected, especially those with businesses closely linked to the price of crude oil because it has suffered its worst plunge since the beginning of futures trading. The reason for this is the failed OPEC negotiations on output, a reduced purchase volume because of economic limitations and a lack of storage capacities for crude oil if output is kept up. Traders and speculators are desperately trying to benefit from the falling prices for crude by getting rid of expensive crude oil contracts. This brought about a further crumbling of prices for crude oil, thus causing a so-called super contango in the oil market. On 20 April 2020, this caused the oil price for West Texas Intermediate (WTI) to drop for the very first time in the history of crude oil futures to USD -37.63 per barrel for May contracts. This black swan event<sup>1</sup> (partly caused by a technical effect) may have taken some market participants completely by surprise.

Black swans are highly unlikely events which are practically impossible to predict, but if they occur, will have a massive economic impact. Such events demonstrate the limits in predictive abilities of even the most complex forecasting models.

### A question of risk management

Just because black swan events cannot be foreseen, they should never be dismissed. The current market situation has raised concerns among Treasury department heads regarding their risk management strategies, methods and processes used so far and made them question the design of their risk cycle and its capacity to mitigate such uncertainties in the long term. Black swan events may be included as extreme stress scenarios. The specific triggering event is in fact irrelevant but what is important is assessing the impact of such an event on the company's KPIs. Pandemics, natural catastrophes, political upheaval and regulations, financial market crashes, technical disruption, reputational damages and other events have been sufficiently frequent over the past years to be able to assess the possible consequences of a severe slump in sales or the explosion of costs on the company's financial and profitability situation.

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<sup>1</sup> The term was coined by Nassim Taleb and his book, *The Black Swan: The Impact Of The Highly Improbable* (Penguin, 2008)

The following questions (which should be part of an effective risk management in any case) are crucial:

- **Risk strategy and risk KPIs**

Be sure to check whether your current risk strategy matches your corporate targets and whether the significance of relevant risks (market, credit and liquidity risks) are known to your company. Can you confirm that the current risk KPIs used to manage the company are truly meaningful as far as their impact on corporate performance KPIs (EBIT, cash, equity ratio) is concerned? It is best to define a clear risk management strategy.

- **Collect data on your exposure**

Do you know the level and time of occurrence of your commodities risk? Get an overview of which transaction types should be included in your exposure and/or your hedges (physical stocks, physical delivery contracts, financial contracts, time buckets, delivery places, etc.). In doing so, it is also a good idea to consider to what extent and with what delay the risks can be passed on, for instance, because a risk is overestimated if only a commodity's purchasing price is looked at without considering how sales prices react to changes in the commodity markets.

- **Risk capacity**

Define which risks you are ready to bear in this strategic area. Be sure to choose an appropriate methodology to measure and report risk. Decide on which risks you may enter into with the help of a risk/reward profile. In doing so, you may want to differentiate between a threshold for times of normal business activity and a different threshold in case of an extreme scenario.

- **Hedging strategies**

Hedging strategies should be formulated in consideration of your goals when purchasing commodities. Is there a possibility to trade for own account or to enter into positions using a market-timing strategy? Define the methodology used to measure the success of your hedging strategy (e.g. benchmarking) and perform it regularly. Make sure the hedge's effectiveness remains intact from both an economic and an accounting point of view, in consideration of the current market situation (e.g. effectiveness of proxy hedges).

- **Framework conditions for commodity trading**

It is important to create a clear governance structure, which enables the definition of framework conditions for commodity trading and clearly governs responsibilities. For this, identify who is entitled to change the existing framework conditions and whether it is possible to override the adherence to these rules. Define which products/instruments are admitted for trading.

### **Short-term and mid-term consequences of the super contango**

The massive slump in crude oil prices has far-reaching consequences for industries along the value chain. If looking at the trade in crude oil, companies (and their treasury departments) acting in this sector will be confronted with the following problems:

- Delays or defaults in payment by private and large customers (gas stations, shipping lines, airlines, truck fleets, etc.) will reduce the liquidity of trading companies. The delays (or even defaults) in payment will affect continuing expenditures that still require payment (storage fees, logistics/operations, margining, salaries).

- Fewer sales to clients will cause discrepancies in volume and forecasts and thus to costs for the unwinding/settlement of positions if amounts cannot be accepted physically due to limited storage. In the medium-term, clients may default, causing further discrepancies between amounts and forecasts.
- Short and medium-term market price fluctuations could cause additional liquidity needs in the procurement portfolio due to margin calls triggered by a market slump. Re-sale risks are also continue to increase due to the market slump.
- Absent cash flows and a looming recession could lower the company's credit rating, which will worsen the availability and conditions of financing from banks and on the capital market.

### **What needs to be done – gathering strength during the crisis**

Companies should use the crisis to harden themselves against further crises. Indeed, a next super contango may be just around the corner – e.g. when June 20 futures expire. The following could be decisive:

- **Enriching risk management with stress tests**

Risk management should not only contain all of the aspects mentioned above but should be expanded to include stress tests. These help to understand what kinds of repercussions extreme situations could have on your company and how you can prepare for them (e.g. with a liquidity reserve, equity reserve). For this, you will need integrated calculation models that include all major influencing factors. Such comprehensive modeling tools for risk effects allow the derivation of early warning indicators that allow you to recognize threats at an early stage. Companies that only start collecting data on their liquidity drivers and their effects or as well as on the structure of their cash flows only once a critical situation arises, waste valuable response time.

- **Creating transparency**

In order to get a quick, comprehensive and understandable picture of market upheavals and other uncertainties and in order to be able to communicate these, you will require a holistic view of your risk exposure. Apart from that you should also have an established solution to present the repercussions on your company's relevant KPIs. A good help is using a powerful ETL tool (such as Alteryx) as well as forecasting models and simulation tools, connected to a BI-supported dashboard reporting. This also allows you to provide senior management with information (if need be, in real time) on an emerging critical situation.

- **Using hedge accounting in accordance with IFRS 9 could be worthwhile**

The publication of IFRS 9 has expanded the possibilities for the recognition of underlying and hedging transactions in the hedge accounting of commodities traders considerably. Hedge accounting stabilizes your results (FVOCI<sup>2</sup>) also in times of volatile markets.

- **Reviewing the issue of accounting for inventories under IAS 2**

According to IAS 2, company inventories are to be recognized at the lower of acquisition/production cost or net realizable value. However, companies subject to a broker/trader exemption may value their inventories at fair value. In the current market situation, this could cause massive changes in value, which would have to be recognized as expenses in the profit and loss statement for the reporting period.

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<sup>2</sup> Fair Value through Other Comprehensive Income

- **Using the contango to your benefit**

The current crude oil market situation also offers many opportunities. The spot price for ICE Gasoil Futures currently stands at a price that is USD 100 lower than the price for delivery as at December 2020. This could be to your benefit, provided the difference covers all of the costs (storage fees, logistics, settlement costs) and the target margin. Obtaining physical deliveries of oil is no problem at all in view of the current oil glut, provided you have somewhere to store it. In doing so, you should observe all of the classical risks for a physical transaction (supplier default risk, premiums/discounts depending on quality, etc.).

In the end, such events may be to the benefit of the treasury because they help demonstrate to Management and to cost controlling the advantages of an effective and comprehensive risk management for risks related to market price, liquidity and default risks thus enabling you to receive the budget required for this. On the other hand, the next time such a crisis arises, treasurers that are not sufficiently prepared may be reproached as not having learned from the past and being mere fair-weather treasurers.

# New OECD guidelines on intra-group financial transactions

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For many years, group-internal financial transactions have been a focus of tax audits. Pushback by the tax authorities sometimes lead to substantial back taxes and double taxation.

On 11 February 2020, the OECD finally published the long-awaited guidelines on financial transactions. This is the first time that companies are provided with global OECD guidelines on how to structure intra **New OECD guidelines** -group financial transactions.

In over 40 pages, the guidelines cover various areas – from loans and cash pooling to guarantees, hedging and internal reinsurance.

In this article, we have selected three core aspects that we will briefly examine in more detail.

## **At arm's length-conditions: a closer look**

Up to now, many companies (and tax audits) merely focused on the appropriateness of the transfer pricing (for example, the interest rate). In the future, companies will also have to answer the following two questions:

1. Should the capital provided in merit be classified as liabilities?
2. Are the remaining contract terms in merit at arm's length?

To determine this, particularly the respective perspectives of the lender and the borrower need to be taken into account.

- Does the lender dispose of sufficient financial resources? In other words, are functions in place to monitor the lending risk? And is there enough capital to bear the risks?
- Based on its business plan, can the borrower prove that it could bear the debt it will have to service from the very beginning? Which debt ratio is appropriate? Why have both parties waived the provision of (existing) collateral? Is there merit in repaying the loan at any time?

## **Creditworthiness**

The main question arising when pricing most financial transactions is how the borrower's or guarantor's creditworthiness can be determined. It is generally agreed that this is done with the help of ratings. However, a wide range of rating approaches have so far been observed in practice – from a standardized group rating applied to all group companies, over the so-called stand-alone ratings where only individual companies are scrutinized to ratings that even take into account an implicit financial backing by the group (the so-called "halo effect").

The OECD guidelines now outline what taxpaying entities should consider when determining individual ratings. In particular, they focus on the effect of implicit group backing – for example, given due to the strategic relevance of a particular group company. In addition, the OECD clarifies that the creditworthiness of the respective financial instrument may differ from the creditworthiness of the receiving group entity.

### **Cash pooling**

Many cash pools factor into their internal pricing the relevant interest rates paid and received that are customary in the market, which the cash pool manager has agreed with a third-party bank. From a tax perspective, a frequently discussed question is whether and to what extent the cash pool participants should receive part of the coordination benefits of the cash pool manager (the so-called netting profits).

The OECD guidelines provide comments on this and recommend that cash pools should be analyzed holistically. One focus should be on how the netting profits are distributed to cash pool participants. The interest rates agreed for the cash pool should explicitly not be compared with current account and lending interest rates from third-party transactions, instead the benefits of cash pooling should result in more advantageous interest rates for the cash pool participants.

Based on the OECD rule, a cash pool manager should only have a coordinating role and accordingly, should only be remunerated leanly, i.e. he or she should not pocket most of the cash pool benefits. If a functional and risk analysis demonstrates that the cash pool manager bears considerable risks (especially liquidity, credit and currency risks), the cash pool can continue to receive a larger part of the cash pool benefits as remuneration. This requires sufficient economic substance on the part of the cash pool manager, resulting from the personnel function on the one hand and the (equity) capital on the other. Furthermore, in line with the ConocoPhillips ruling handed down in Norway, the OECD confirms the view that long-term balances in the cash pool should be priced like longer-term loans.

### **Our recommendations**

The OECD's publication could be the ideal external trigger for treasury managers to scrutinize this year the contractual, economic and pricing structure of the various business relationships in intra-group financing together with their colleagues from the tax department.

Our recommendation is to draw up transfer pricing guidelines that help the treasury department implement a pricing logic in its day-to-day business that is appropriate from a tax perspective, thus reducing the administrative workload for the tax department when it has to draw up transfer pricing documentation for treasury transactions. Our experts are happy to assist you with this endeavor.

# Digitalization of promissory notes

## Opportunities and challenges for Treasury

Finance and Treasury Management Switzerland

In 2019, nearly 28 billion euros were placed in promissory notes (a.k.a. bonded loans) through 160 transactions. This means an increase of approx. 16% compared to the previous year and a tripling of the volume compared to 2009. Some of the largest transactions were placed digitally. For instance, Deutsche Lufthansa AG collected 800 million euros in digital form only and ZF Friedrichshafen AG settled more than 85% of its EUR 2.1bn promissory notes digitally. Not only is there a steady increase in the total volume of promissory notes, we are also witnessing that this kind of transaction is increasingly handled on digital platforms. However, this not only opens up new options for corporate financing, there are also risks that should be considered before venturing into this territory.

Traditionally, the process of setting up a promissory note requires a multitude of analog interactions between the three main actors – issuers (companies), arrangers (banks) and investors. To obtain the legally required certificates, promissory notes must be structured and marketed in advance, which is traditionally done by banks. On the one hand, these advise the issuer on how to structure the note and, on the other hand, handle its structuring and marketing. On an average, the issuer is charged between 0.75% and 1.5% of the amount borrowed for the arranger's work, as well as for fees to the paying agent over the period of the note. Further costs may be concealed in the interest paid by the arranger. The arranger negotiates the interest to be paid with each investor individually in the form of a locked-in interest rate. Because the issuer does not partake in these negotiations, it is impossible for it to precisely quantify the costs incurred in advance.

The non-transparent cost structure is one of the reasons for choosing digital platforms for promissory notes. Another compelling reason is the simplicity of regulation. The placement of a promissory note requires a large number of individual manual tasks in addition to preparing and sending certificates by post. It is precisely these individual steps that, to a large extent, can be performed digitally.

There are three different approaches:

1. Digital platforms are operated by the banks themselves to digitalize their own processes to make them more efficient. This is the only form that does not involve specialized FinTechs in the process of a promissory note.
2. Digital platforms operated by FinTechs collaborating with banks. The aim on the one hand is a digital, efficient and cost-saving process and on the other hand the integration of banks and their network in order to reach, for example, the widest possible range of investors. To this end, a platform can work with just one bank or with several banks.
3. Digital platforms operated by FinTechs, which use their disruptive approach to try to replace banks and thus act as sole arranger. In this case, issuers and investors are meant to meet without the help of any banks, partly or completely taking over the value-generating process from the banks at more efficient conditions.

All three options offer the possibility to structure and place the promissory notes digitally from beginning to end. However, classical back-end processes such as the final certification by a notary public will still have to be done physically. In theory, however, even this step could be performed digitally using blockchain technology. The most compelling argument for block chain, apart from its efficiency, is its tamper-proof documentation. There have already been first successful pilot transactions on private block chains, with the certification performed using a qualified electronic signature. Parallel to this, however, a conventional paper-based certification process was also carried out in order to meet the legal requirements. Other processes that still need to be digitalized are the transfer and termination of promissory notes. In the future, blockchain could even be used for this.

As long as the legal requirements are met, the use of digital platforms still offers several advantages. For one thing, costs are lower due to an efficient organization; these savings can be passed on to the issuer and result in lower financing costs. In addition, a digital platform is able to reach more investors in less time than an analog process ever could. This can amplify both the investor base and the issue volume. All these factors therefore lead to a shift in the usual volumes, among other things. While conventional promissory notes are usually placed for amounts between EUR 50 and 500 million, digital promissory notes may be placed for amounts as low as EUR 10 million but are not capped.

This shift offers treasurers an attractive financing alternative to equity bonds and traditional bank loans. While the latter often require restrictive collateralization and may also lead to a certain dependency on banks, promissory notes are unsecured bilateral loan agreements with a broad group of investors (such as insurance companies, pension funds, family offices, investment companies, banks). Their advantage over traditional bonds lies in the fact that they do not require an EU-compliant prospectus, on the one hand, and in the relatively short implementation period (promissory notes: approx. 6 to 10 weeks; bonds: approx. 4 to 6 months), on the other. Both factors lead to a noticeable reduction in the cost of promissory notes compared to traditional bonds.

In addition to the opportunities mentioned, there are also risks that must be considered when integrating digital platforms. For example, there is always a certain degree of technical risk associated with digital platforms. No platform, no matter how excellent its design and precautions, is completely immune to technical defects and problems. There may also be a legal risk if a platform has not obtained the statutory permission to issue promissory notes commercially. In the absence of a license, not only could the money collected be frozen, but the reputation of the issuer could also be damaged seriously. This risk can be significantly reduced by obtaining information on the platform from the competent authorities.

A potential financial risk may arise if the digital platform does not have access to a sufficiently large investor base, and thus the targeted issue size is not achieved. This may be the case, for example, if only few potential investors use the platform as a general rule. The same situation can also occur if only investors with a certain investment focus (e.g. on individual specific industries) use the platform. Both situations reduce the number of potential investors and can therefore lead to a failure to achieve the desired issue target.

To put it in a nutshell: treasurers do not have to decide for or against digital solutions. They may well opt for a hybrid approach consisting of conventional and digital variants. Here, both approaches are combined to suit individual requirements, thus enabling both the security of a conventional approach with the efficiency of digital platforms. Regardless of which approach is chosen, issuers benefit from more flexible volumes and more efficient cost structures as a result of the move to digital platforms. This ensures that promissory notes remain an attractive source of financing for both SMEs and international corporations.

# Predictive analytics for cashflow forecasting

Finance and Treasury Management Switzerland

## Computer-assisted forecasting methods help corporate treasuries with the company-wide liquidity planning

Companies can survive for a long time without profits, but in the worst case, they can become insolvent within a few days if the necessary liquidity reserves are not ensured. Many a company has found itself in a liquidity crunch following the concurrence of certain events. One such event is currently the Coronavirus crisis that brings countless companies to the brink of their liquidity limits. But regardless of the Corona crisis, recent surveys among treasurers revealed that liquidity planning was and still is at the top of every Treasury's agenda. To keep liquidity at the forefront helps to ensure that liquidity fluctuations are adequately hedged and that general liquidity shortages can be overcome safely and cost-effectively.

Basically, there are several approaches (direct and indirect method) and planning methods to do this. The choice of planning method depends on many company-specific parameters such as business model, business management, complexity and availability of data and systems. An overview of state-of-the-art methods and their requirements as well as a definition of planning approaches may be found in our February newsletter.

In the following we focus on the so-called predictive analytics in cash forecasting (PA-CF), one of the direct approaches in the liquidity planning.

Predictive Analytics is a sub-discipline of data mining; it uses historical data to predict future events, for instance in Controlling, Sales, Treasury/Finance but also with regard to insurances, mobility and marketing. Historical data is used to prepare a mathematical model that captures important trends and seasonal discrepancies, extrapolating time series into the future. This predictive model is then applied to current data to predict what will happen next. At this point, actions are proposed to achieve optimal results, which is part of the next phase, Prescriptive Analytics.

Predictive analytics in cash forecasting apply stochastic methods to generate forecasts of individual liquidity-relevant planning items based on data analysis. To obtain these, additive regression, autoregressive models (such as ARIMA) or even neural networks are used for modeling, whereby the transparency of the forecast is no longer a given with the latter. Initially, the granularity of an item is irrelevant. In principle, a forecast can be created for cash balance, total cash flow, free cash flow, operating cash flow, as well as for individual business transactions (for example, payments from sales). As such, the complexity and degree of detail of the modeled time series are fundamentally flexible. Also, the general statement applies that the higher the granularity, the more specific the understanding of the underlying business processes; these can then be incorporated.

## **Advantages of predictive analytics approaches – an overview**

A classic example in Corporate Treasury is to forecast liquidity needs for daily use over a period of 13 weeks using historical data as well as external and internal business-relevant time series.

Designing and implementing a predictive analytics framework, described below, is helpful for this. Before anything else, it should be said that a consistent implementation will result in a number of advantages for the liquidity planner, some of which will be highlighted below:

- Predictive analytics methods provide liquidity managers with information that can significantly improve the efficiency of decision making, as it is based on reliable information and high-quality data. It skips the need for a decentralized process, whereby the generation of planning data is usually the responsibility of the individual reporting units.
- By introducing predictive analytics, the process of liquidity planning can be automated and ideally be performed at the push of a button. This replaces the manual preparation of the liquidity forecast, which is very time-consuming and requires recurring coordination efforts that place a major burden on Treasury.
- The number of possible applications in liquidity management is practically unlimited. Any number of models as well as internal and external explanatory input parameters may be used to optimize forecasts, which means that any number of complex issues can be analyzed.
- The process is also scalable, which means that the software continues to function when size or volume is changed to meet user requirements. When applied to the predictive analytics approach, it means that an increasing number of time series can be analyzed without major adjustments to the currently used model portfolio. The computation time per time series does not change significantly, although it must be clearly emphasized that the total time required will increase. In practice, this can reflect changes in the business model or changes in the business units due to M&A activities.
- Downstream software solutions, such as business intelligence reports, can present the results in a highly detailed, user-friendly form tailored to the target group. As the aggregation levels can be freely defined, both the Board of Directors and the operational treasurer are provided with decision-related information at the required level of granularity that can be called up at any time.

## **Framework necessary to implement predictive analysis**

The requirements for using and implementing a liquidity forecast in Treasury can vary a great deal from company to company. For this reason, it is particularly important to first prepare the framework for the future modus operandi as well as for every individual project. Usually, there are six steps to introducing new forecasting methods:

### **Target mapping**

First, the general project objectives and expected results as well as their use within the liquidity planning are defined. Apart from technical requirements such as for instance the aggregation level of the time series to be forecast, also so-called non-functional requirements (NFR) (which consist mainly of technical framework conditions) need to be defined. In order to estimate the project's required budget and time frame, the degree of automatization and the number of positions to be analyzed are also decisive. In this step, many companies often wonder about the targeted embedding of data science in the Target Operating Model when it is their first such project.

## **Data extraction**

All forecasting models must be fed with internal and external data sources. Based on the project's objectives, an initial catalog of key figures must be prepared that defines the data to be extracted from the source data systems. A data model is then derived and implemented based on the catalog of key figures. In doing so, it is important to keep an eye on the requirements and special features of each individual source systems for a smooth data extraction process in the future.

## **Data cleansing**

Ensuring adequate data quality is the ultimate goal and, as experience shows, also very time-consuming. In principle, using a handful of indicators, such as the uniqueness of individual entries or the completeness of data records, is often highly beneficial for data quality. The great advantage of high-quality data is that useful information can already be identified and analyzed in this step. A nice side-effect of this sub-step is that data that was recorded incorrectly in the source systems is detected and corrected. This often has positive effects on other departments, for instance in terms of accounting quality, which is not to be underestimated.

## **Modeling**

Predictive modeling makes it possible to prepare forecasting models automatically. Selecting the model and calibrating the parameters is done automatically by means of so-called trainings, whereby selected sets of input parameters are used to calibrate the model. This leads to the selection of optimal stochastic models for each liquidity item examined. In addition to the history and the time series to be forecast, the following parameters, for example, are used as input factors:

- Quality-assured data from internal and external sources
- Structural effects such as seasonal discrepancies, business cycles, trends
- Identified and analyzed anomalies, significant outliers

Theoretically, the model universe is infinite, but from experience, the model families of additive regression and ARIMA have proven to be helpful liquidity estimators. A model's quality is reviewed using predefined error metrics. These metrics measure the difference between actual and target values. They should be selected in a targeted and question-based manner, as not every metric should be applied to all models.

## **Deployment**

The generated forecasts are fed into the liquidity planning process and decision-making processes with the help of business intelligence tools (such as dashboards). Here, a decision must be made whether the conclusions are then automatically executed by the system or whether they must first be interpreted and initiated by corporate treasury staff. In the first case, automation is indispensable, although it does not rule out human involvement.

## **Monitoring and adjusting the model**

The ongoing monitoring of the model serves to review whether the requirements of models that are used to compute the liquidity forecasts are met. In addition, it must be ensured that requirements stemming from changes in the IT infrastructure are implemented at all times.

## **Predictive forecasting methods in hybrid planning approaches**

The 6-step framework for setting up and operating predictive analytics in cash forecasting provides a highly flexible methodology for generating forecasts in liquidity management and implementing them in regular operations. However, it does not necessarily need to be applied to all liquidity-relevant time series. For instance, volatile investment cash flows are often better estimated by the individual departments and can then be incorporated into liquidity planning.

As mentioned at the outset, there are several approaches to liquidity planning and predictive analytics is one of them. In addition to its greatest strength in modeling complex issues in any granularity, this approach has also been shown to have weaknesses. Depending on the model, the transparency of the results is significantly limited and the responsible planner then faces the question to what extent he/she trusts the forecast models. As a consequence, on the way to a fully automated solution, Corporate Treasury initially should favor a so-called hybrid process that combines several approaches (depending on the business transaction), incorporating a plausibility check by the responsible planner. As time goes by, trust will grow steadily, and with it the degree of automation of the predictive forecasting method.

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