

Central banks should communicate their interventions in the foreign exchange market

By Lukas Menkhoff and Tobias Stöhr

Central banks frequently intervene in foreign exchange markets. Using recognized criteria this report analyzes the probability of success in a data set of 4,500 intervention episodes in 33 countries. It is important to differentiate among exchange rate regimes because each focuses on a different goal. While flexible exchange rate regimes intervene less frequently and seek to influence trends, other regimes target exchange rate stabilization by establishing a band within which the exchange rate can float. Interventions are generally more successful when they involve larger volumes, follow the exchange rate trend, and are oriented on the fundamental value. When decision makers also communicate their interventions or changes to exchange rate policies, the effects of these are likely to be stronger. Central bankers should therefore complement their interventions with communication to improve their likelihood of success.

Policy makers intervene in many markets, including the foreign exchange market. They do so in order to keep the prices of imports at a low level, make their own exports competitive, or ensure planning security for companies. Interventions, that is, the buying or selling of foreign currencies, are key policy instruments. If a central bank purchases a foreign currency and sells its own to do so, its own currency weakens, and its foreign exchange rate falls.¹ A prominent example of this is the Swiss National Bank, which has attempted to prevent the appreciation of the Swiss franc for years.² Of course the extent to which its measures are successful and which role the decision makers' communication plays in their success depends on the intervention's target.

Intervention targets and success criteria depend on exchange rate regime

The literature highlights two targets of foreign exchange market interventions: changing the exchange rate level and limiting fluctuations in the short-term exchange rate.³ Central bankers also list these targets in responses to surveys (Table 1). The recent theoretical literature has also provided answers to the question of why countries

¹ An analysis of activities of 33 central banks between 1995 and 2011 shows that these have intervened on about a fifth of observed trading days (19 percent) and even on a third of days (34 percent) in narrow band regimes. See Lukas Menkhoff and Tobias Stöhr, "Foreign exchange market interventions: a frequently used and effective tool," *DIW Economic Bulletin* no. 18 (2017): 181–189 (available online, accessed September 29, 2017. This also applies to all other online sources in this study, if not stated otherwise); and Dietrich Domanski, Emanuel Kohlscheen, and Roman Moreno, "Foreign exchange market intervention in EMEs: What has changed?" *BIS Quarterly Review* September (2016): 65–79.

² See Nikola Mirkov, Igor Pozdeev, and Paul Söderlind, "Toward removal of the Swiss franc cap: Market expectations and verbal interventions," (University of St. Gallen, School of Finance, 2016); and Urban J. Jermann, "Financial markets' views about the Euro-Swiss franc floor," NBER Working Paper no. 21977 (2016).

³ See Lucio Sarno and Mark P. Taylor, "Official intervention in the FX markets: Is it effective and, if so, how does it work?" *Journal of Economic Literature* 34 (2001): 839–868.

Table 1

Aims of interventions according to central banks

In percent

Aims of interventions	Very important	Not important
Curbing excessive exchange market speculation	57.9	21.1
Maintaining monetary stability	52.6	26.3
Discouraging sharp capital inflows or outflows	26.3	42.1
Building or reducing foreign exchange reserves	31.6	47.4
Smoothing the impact of commodity price fluctuations	21.1	57.9
Maintaining or enhancing competitiveness	21.1	57.9
Alleviating FX funding shortages of banks or corporations	26.3	63.2

Note: Based on a voluntary survey of central banks in 2013 in which 19 of them participated. Reported percentages are the shares of central banks that answered accordingly.

Source: Mohanty and Berger (2013).

© DIW Berlin 2017

might want to stabilize their currency in the long term.⁴ According to it, steering the exchange rate would allow for the better absorption of macroeconomic shocks, such as price changes on key export goods.

In different exchange rate regimes, foreign exchange market interventions have different targets. With this in mind, the three most important regimes are: floating exchange rates, broad exchange rate bands, and narrow exchange rate bands.⁵ Pegged exchange rates are the fourth regime. In this case, interventions are not independent policy instruments. Instead, they are necessary measures for maintaining the exchange rate at the level specified.

With a floating exchange rate, interventions often intend to push the exchange rate back to its fundamental value or reverse an exchange rate trend. With broad and narrow bands, trend reversal plays a much more limited role, and exchange rate stabilization is the most important target. However, many central banks strive to smooth exchange rate trends independently of the exchange rate regime.

The empirical measures of success for interventions must always correspond to the relevant targets. The three targets listed above can be directly associated with three

⁴ In particular, see Xavier Gabaix and Matteo Maggiori, "International liquidity and exchange rate dynamics," *Quarterly Journal of Economics* 130 (2015): 1369–1420; and Tarek Hassan, Thomas M. Mertens, and Tony Zhang, "Currency manipulation," (working paper, University of Chicago, 2016).

⁵ These definitions follow the coarse grid classification in Carmen M. Reinhart and Kenneth S. Rogoff, "The modern history of exchange rate arrangements: A reinterpretation," *Quarterly Journal of Economics* 119 (2004): 1–48. According to this, narrow bands permit exchange rate fluctuations of plus/minus two percent.

measures of success: the event criterion, the smoothing criterion, and the stabilization criterion (Box).

Database for interventions in foreign exchange markets

We applied these measures to an extensive data set that includes information on the net volume of interventions carried out in 33 countries over a period of ten to 15 years (1995 to 2011). Most of the information came directly from central banks. It cannot be published but is approved for use in aggregated analyses.⁶ Due to the large number of countries in the database, for the first time ever we were able to establish stylized facts that hold for a large variety of different countries. By contrast, most of the previous literature was based on just a handful of large developed economies.

Other general conditions for interventions

In addition to the chosen exchange rate regime, the success of foreign exchange market interventions depends on a series of general conditions that have been analyzed in the literature: the volume of the intervention, market conditions during the intervention, and the way decision makers communicate it.

Larger volumes increase the likelihood of success

It seems plausible that higher volumes contribute to achieving the intervention's targets.

The effects of any given intervention volume depend to a large extent on whether or not a central bank intervenes in the highly liquid euro/US dollar market or in that of an ancillary currency, for example the Peruvian sol. In the former market, the daily trading volume is around 1,100 billion US dollars and in the latter, less than 500 million US dollars.⁷ The intervention's average daily volume of just under 50 million US dollars⁸ is virtually insignificant in the former highly liquid market. In the latter less liquid market, it would be highly significant and therefore, more likely to have a large impact. Unfortunately, complete data on the trading volumes in foreign exchange markets were not available, and we had to relate the size of the intervention to the GDP of the relevant economy in order to achieve uniformity (Figure).

⁶ See Marcel Fratzscher et al., "When is foreign exchange intervention effective? Evidence from 33 countries," *DIW Discussion Papers* no. 1518 (revised) (2017) (available online).

⁷ See Bank for International Settlements, "Triennial central bank survey: Global foreign exchange market turnover in 2016," (Bank for International Settlements, Basel, 2016) (available online).

⁸ See Lukas Menkhoff and Tobias Stöhr, "Foreign exchange market interventions: a frequently used and effective tool".

Box

Success criteria for foreign exchange market interventions

Instead of examining the correlation between interventions and the exchange rate separately on all days, event studies focus on the changes in the exchange rate within a window around the intervention's starting point. This helps to measure the effect of interventions more reliably as the influence of other factors can be reduced. Since foreign-exchange market interventions usually occur over several days, we observed "intervention episodes," defined as periods of intervening in the same direction. They can be single days but are often multiple-day episodes, sometimes with brief interruptions.

The econometric approach is based on analyzing systematic patterns for several thousand episodes. One of four success criteria was used as a dependent variable with the value "1" in the case of success and "0" if the intervention was a failure. We ran multi-variant regressions to analyze which explanatory factors systematically correlated with higher probabilities of success.

The event criterion compared the exchange rate on the evening before the intervention with the exchange rate on the last day of the intervention episode. If the exchange rate changed in the

intended direction, the intervention was termed a success. This criterion is particularly appropriate for central banks that want to actively change the exchange rate.

The smoothing criterion compares the changes in the exchange rate on the fifth business day before the intervention to the change during the intervention episode. This criterion is only usefully defined if the direction of the intervention is appropriate for smoothing the exchange rate, i.e., defining the absolute rate of increase. If the (absolute) rate of increase fell during the episode, the intervention was termed a success.

The stabilization criterion represents the targets of the countries that intend to keep their exchange rate stable within a narrow band. Under this criterion, an episode is a success if the exchange rate in the episode remains within a band of plus/minus two percent surrounding the exchange rate on the evening before the intervention. The two-percent mark is typically mentioned in the literature. Theoretically, all three success criteria can be met simultaneously. They do not rule each other out, even if central banks place different weight on specific criteria.

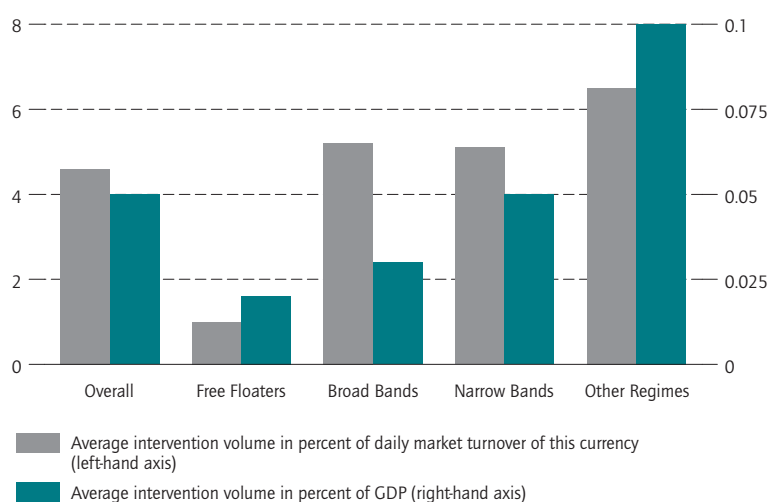
Interventions with or against the market trend

Of course, alongside the intervention's volume, market conditions play a key role. As mentioned above, central banks often intervene to counter the prevailing market trend ("leaning against the wind"). Leaning against the wind has a lower likelihood of success than intervening in harmony with the current market trend. In the present study we observed the changes in the exchange rate in the two-week phase prior to an intervention in order to determine the trends. If, for example, the central bank's home currency weakened during that phase and the central bank sold foreign currency and purchased its own as a means of supporting it, this would be an intervention counter to the trend.

Another key market condition is the relation between the current exchange rate and its fundamental value. We can presume that interventions to restore the fundamental value are more successful, as exchange rates tend to move toward that value in the long term in general. Unfortunately, it is not always possible to clearly determine a currency's fundamental value. Purchasing power parity exists when a bundle of goods purchased in the countries being examined would cost the same as the amount paid to exchange the currency. It is a good approximation of a currency's fundamental value. The

Figure

Intervention volumes by market size and exchange rate regime



Note: Market turnover (right vertical axis) is not available for all countries.

Source: Authors' own calculations.

© DIW Berlin 2017

Interventions are largest in narrow band regimes.

Table 2

Intervention success under the event criterion

Regime-specific constants	
Free floaters	0.532*** (0.053)
Broad bands	0.414*** (0.024)
Narrow bands	0.213*** (0.012)
Other regimes	0.133*** (0.021)
Intervention characteristics	
Average daily intervention volume in % of GDP	0.330*** (0.104)
Intervention "with the wind"	0.099*** (0.015)
Intervention towards fundamental value	0.004*** (0.001)
Share of maximum currency-specific volatility	0.004 (0.041)
Observations	4.549
Adjusted R ²	0.373

Note: See Box 1 for explanation of criterion. Coefficients based on least squares estimation. Standard errors in parentheses. *** and ** indicate statistical significance at the 1 and 5 percent level, respectively.

Source: Authors' own calculations.

© DIW Berlin 2017

moving average of the exchange rates over the past three years is a conventional alternative measure.⁹

Volatile foreign exchange markets influence interventions

Volatility is expected to make interventions more difficult. At the same time, volatility will also trigger interventions; in particular when regimes with relatively stable exchange rates must be stabilized. We quantified volatility by calculating the fluctuations in exchange rates relative to their highest values within the period of observation.

Estimating the determinants of the probability of success

In order to estimate the effectiveness of foreign exchange market intervention, we differentiated among the three key exchange rate regimes and a fourth group consisting of all remaining regimes. We captured the regime

influence via four regime-specific constants in the estimate. The other determinants discussed here were also considered. As a result, we were able to explain the success of interventions based on five variables. The previously explained success criteria were used as dependent variables (Box).

First, the result for the event criterion is shown in Table 2. We used ordinary least squares as estimation method to ensure that the coefficients can be easily interpreted.¹⁰ According to our estimates, the baseline probability of successfully changing the exchange rate (i.e. ignoring intervention characteristics) in the case of floating exchange rates is 53 percent. This is hardly better than a random result, but it is significantly higher than the probabilities for the other regimes (13 to 41 percent). However, changing the exchange rate with an intervention is typically not a main policy goal in other regimes; therefore, other success criteria are more important here.

The circumstances determine the results

In addition to considering useful regimes, general conditions are key factors that contribute to the success of an intervention. The most important one is the intervention's volume. The coefficient shows the value for one percent of GDP, such that a daily intervention amounting to 0.4 percent of GDP (equal to eight times the average volume in the case of floating exchange rates) would increase an intervention's success by 13.2 percentage points (0.4×0.330 , see Table 2). The intervention must be powerful to achieve such a significant effect. If an intervention follows the trend, the probability of its success will increase by another 9.9 percentage points. Ultimately, an intervention should help push the rate toward the fundamental value. A deviation from the fundamental value equal to the median would yield a further improvement of 3.5 percentage points. These components can be added together to result in a success rate of 80 percent ($53.2 + 13.2 + 9.9 + 3.5$).

This is the first time that estimated values have conveyed a systematic impression of the potential determinants of intervention. However, most interventions lean against the wind, in which case their probability of success would be around ten percent lower. On the other hand, the deviation from the fundamental value can also be much larger, amplifying the positive effect on the success of the intervention. Central banks often work with volumes that are more than eight times the average vol-

⁹ The results are valid regardless of using longer or shorter moving averages, whether the averages are mapped including the day of the intervention or it is bracketed, or whether the purchasing power exchange rate as calculated by the International Monetary Fund (IMF) is used. See Fratzscher et al., "When is intervention effective?"

¹⁰ Logit models, regression models with categorical dependent variables, are a more appropriate methodology. They lead to qualitatively identical results but are more difficult to interpret.

ume.¹¹ Regardless of the value used, it becomes apparent that interventions are frequently successful, and central banks have an influence on their success.

Success with regard to other criteria

The event criterion is a useful measure of success for floating exchange rates, but the stabilization criterion is key in regimes with narrow exchange rate bands. In these regimes, the probability of success was equal to 95 percent even without taking the intervention characteristics into consideration (Table 3). The additional coefficients are either statistically insignificant or have little effect. Volatility alone can exert a major influence. The relevant coefficient showed that in situations of maximum volatility (very severe crises), the probability of an intervention's success in borderline cases could drop to only 35 percent. It also points out the relevance and difficult circumstances of systematic central bank devaluations or appreciations that follow the policy of narrow exchange rate bands.

In a regime of broad exchange rate bands, the constants are between 41 and 71 percent.

Preliminary conclusions: Interventions are likely to succeed

Intervention success is both probable in all exchange rate regimes as well as in view of the three success criteria. Under realistic conditions and if the intervention is properly designed, it can be expected to succeed in 80 percent of the cases.

However, this analysis has its limitations. First, the event study approach used only a very limited time window around one intervention. It allowed us to exclude other factors influencing exchange rates almost completely, but was inconclusive regarding the sustainability of an intervention's success. Second, the estimates presented here do not control for other possible policy measures within the period of observation. For example, monetary policy might have supported the currency's exchange rate via higher interest rates or by monetary restrictions. Further analyses did not find a systematic influence of specific monetary policy measures,¹² indicating that sterilized foreign exchange market interventions can indeed be considered an independent policy instruments. Third, other influences such as macroprudential policies—policy measures implemented to mitigate systemic finan-

Table 3

Intervention success under smoothing and stabilization criterion

	Smoothing criterion	Stabilization criterion
Regime-specific constants		
Free floaters	0.798*** (0.043)	0.435*** (0.044)
Broad bands	0.712*** (0.028)	0.609*** (0.024)
Narrow bands	0.745*** (0.018)	0.949*** (0.009)
Other regimes	0.835*** (0.031)	1.004*** (0.013)
Intervention characteristics		
Average daily intervention volume in % of GDP	0.115 (0.077)	0.104 (0.064)
Intervention "with the wind"	-0.065** (0.028)	0.011 (0.012)
Intervention towards fundamental value	0.001 (0.001)	-0.004*** (0.001)
Share of maximum currency-specific volatility	0.215*** (0.05)	-0.597*** (0.039)
Observations	1.787	4.549
Adjusted R ²	0.8	0.81

Note: See Box 1 for explanation of criteria. Coefficients based on least squares estimation. Standard errors in parentheses. *** and ** indicate statistical significance at the 1 and 5 percent level, respectively.

Source: Authors' own calculations.

© DIW Berlin 2017

cial risks—could also play a role. Due to the lack of a suitable database, we could not examine these factors in greater detail.

Different forms of communication about exchange rates

Studies on monetary policy have documented that central bank communication has a significant influence on the effectiveness of policies.¹³ An examination of business media revealed the intense coverage accorded to the corresponding announcements. Market participants and observers are both extremely interested in correctly predicting the further course of a given monetary policy—with regard to major central banks such as the US Federal Reserve in particular, the speculation is lively, and each statement by the responsible parties gets analyzed from all angles.

¹¹ See the example of Japan in Lukas Menkhoff and Tobias Stöhr, "Foreign exchange market interventions: a frequently used and effective tool".

¹² See Fratzscher et al., "When is intervention effective?"

¹³ See Alan Blinder et al., "Central bank communication and monetary policy: A survey of theory and evidence," *Journal of Economic Literature* 46 (2008): 910–945.

Table 4

Intervention success by form of communication

	Event criterion	Smoothing criterion	Stabilization criterion
Unnoticed interventions (0/1)	-0.044 (0.033)	-0.041 (0.031)	0.014 (0.03)
Oral interventions (0/1)	0.081*** (0.018)	-0.086*** (0.025)	-0.057*** (0.014)
Turbulent times (0/1)	-0.058 (0.041)	-0.130* (0.074)	-0.053 (0.044)
Oral interventions in turbulent times (0/1)	0.137** (0.06)	0.175** (0.085)	-0.065 (0.054)

Note: See Box 1 for explanation of criteria. For additional unreported control variables see table 2 or Table 3. Coefficients can be added up to get the total effect of oral intervention in turbulent times. Coefficients based on least squares estimation. Standard errors in parentheses. ***, **, and * indicate statistical significance at the 1, 5 and 10 percent level, respectively.

Source: Authors' own calculations.

© DIW Berlin 2017

Interventions in the foreign exchange markets are basically of the same nature. Here as well, the central bank's plans and their possible effects on the exchange rate are subjects of great interest.

Nowadays central banks design their communication with market participants very carefully. They generally convey information on their policies in three forms. First, they can confirm interventions officially and in detail. Second, they can allow their interventions to be made public without providing direct confirmation. This is frequently done through the participating commercial banks with which the central bank completes its intervention transactions: they share their knowledge with market participants or the media. Third, the central bank can also secretly intervene and to the greatest extent possible, prevent relevant information from becoming public.

In addition to the communication that accompanies individual interventions, some general communication is directed toward exchange rate policies. The second form occurs much more frequently. In the literature, it is called *oral intervention* as opposed to actual intervention.¹⁴

In order to analyze communication we required a corresponding database. The conventional approach is to evaluate electronic press archives, searching a word or sequence of words specified in advance.¹⁵ Less developed

countries, in general, have fewer (independent) media that could inform the public on foreign exchange market interventions. The resulting database is therefore necessarily incomplete and somewhat distorted towards more industrialized countries. However, a feasible alternative for empirically recording communication does not exist.

Official confirmation of interventions is rare

We found that the large majority of interventions (94 percent of all intervention episodes) were not mentioned, meaning they were neither officially confirmed nor the subjects of reports. However, examining floating exchange rates alone the value dropped to 62 percent. There are fewer interventions of this kind, and therefore individual interventions are highly newsworthy (perhaps because countries with greater press diversity are represented here). The large majority of press mentions are based on rumor; only one percent of all intervention episodes are officially confirmed. For floating exchange rates alone, this proportion rises to 24 percent.

By contrast, oral interventions are much more important: 52 percent of all intervention episodes are communicated in this manner. In regimes with floating exchange rates the value rises to 97 percent, and for broad bands it is just under 100 percent (99.6 percent to be precise). Oral interventions occur in only 31 percent of narrow exchange rate bands, presumably because the exchange rate only fluctuates within a narrow band anyway.

In the following section, the above-mentioned instruments of analysis were applied in two steps: initially for a single communication variable and then for various communication instruments within the context.

Oral interventions are most effective

The analysis showed that the effect of interventions is amplified when market participants are aware of them (Table 4). The effect is particularly powerful when the intervention is officially confirmed. Depending on the success criterion, oral interventions have a mixed effect. It is highly positive with regard to the event criterion, but tends to be negative with regard to the other two criteria.

Oral interventions occur more frequently than other communication forms. It comes as no surprise that they overlay the previously significant effects of the other instruments, rendering them insignificant. Unobtrusive interventions tend to be less effective (but the coefficients are insignificant). Differences in the content and general conditions of oral interventions can lead to different effects. This is why we also observed their use during turbulent market phases, in which their positive effect with

¹⁴ See Marcel Fratzscher, "Oral interventions versus actual interventions in FX markets—An event study approach," *Economic Journal* 118 (2008): 1079-1106.

¹⁵ The Factiva database was used for this study.

regard to the event criterion is reinforced and the negative basic effect with regard to the smoothing criterion¹⁶ is virtually canceled out. Oral interventions are particularly important for central banks with narrow exchange rate bands when the target of exchange rate devaluation or appreciation is to break into a new band. An additional analysis showed that countries that do not have a transparent exchange rate policy could benefit from oral interventions.

Conclusions

This study shows that central bank interventions in foreign exchange markets can be quite successful. As a rule of thumb, the interventions observed were successful in up to 80 percent of the cases. There were many indications that the interventions analyzed represented independent policy instruments. The results does not seem to be caused by simultaneous monetary policy measures, such as changes in the interest rate.

¹⁶ We can presume that communication is used in "difficult" cases in particular, in which the probability of success is lower than average.

Lukas Menkhoff is head of the International Economics department at DIW Berlin | lmekhoff@diw.de

Interventions have different targets depending on the exchange rate regime. It is therefore appropriate to use corresponding success criteria. The probability of success is greater if an exchange rate must be kept within a band than if a change needs to be reversed. It increases as the intervention volume increases. The probability of success also increases when the intervention follows the current trend and aspires to return to the fundamental value. The design of an intervention as well the circumstances under which the central bank intervenes influence the likelihood of success.

Interventions are, in general, more effective if they become public in the market, particularly when the relevant officials confirm them.

Appropriate statements made by decision makers can reinforce the effect of interventions. In the process, they can make use of the statements' signaling effect. Market participants can receive information about future central bank policy from them, so the intervention's effect does not solely emanate from the foreign currencies traded. Central banks should thus combine their interventions with communication more frequently.

Tobias Stöhr is a Research Associate at the International Economics department at DIW Berlin | tstoehr@diw.de

JEL: F31; F33; E58

Keywords: Foreign exchange intervention; exchange rate regimes; actual interventions; communication.



DIW Berlin – Deutsches Institut
für Wirtschaftsforschung e.V.
Mohrenstraße 58, 10117 Berlin
T +49 30 897 89 -0
F +49 30 897 89 -200

Publishers

Prof. Dr. Tomaso Duso
Dr. Ferdinand Fichtner
Prof. Marcel Fratzscher, Ph.D.
Prof. Dr. Peter Haan
Prof. Dr. Claudia Kemfert
Prof. Dr. Lukas Menkhoff
Prof. Johanna Mollerstrom, Ph.D.
Prof. Karsten Neuhoff, Ph.D.
Prof. Dr. Jürgen Schupp
Prof. Dr. C. Katharina Spieß
Prof. Dr. Gert G. Wagner

Reviewer

Dr. Malte Rieth

Editors in chief

Dr. Critje Hartmann
Mathilde Richter
Dr. Wolf-Peter Schill

Editorial staff

Renate Bogdanovic
Dr. Franziska Bremus
Rebecca Buhner
Claudia Cohnen-Beck
Prof. Dr. Christian Dreger
Dr. Daniel Kempfner
Sebastian Kollmann
Matthias Laugwitz
Markus Reiniger
Dr. Alexander Zerrahn

Layout and Composition

Satz-Rechen-Zentrum, Berlin

Sale and distribution

DIW Berlin
ISSN 2192-7219

Reprint and further distribution—including excerpts—with complete reference and consignment of a specimen copy to DIW Berlin's Communications Department (kundenservice@diw.berlin) only.