Identifying jumps in financial time series: a comparative study of jump detection tests

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Declaration

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Philosophy in the University of the Cape Town. It has not been submitted before for any degree or examination in any other University.

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Abstract

There is consensus in the financial literature that traded asset prices may be subject to rare, but sudden movements, resulting in asset price discontinuities, known as jumps. It is therefore important to not only incorporate jumps into diffusion models but also to disentangle the diffusion component, which can be hedged, from the jump component, which typically cannot. Consequently, there is a need to identify jumps in financial time series. A number of non-parametric finite activity jump detection tests have been proposed by various scholars. In this dissertation, a comparative study amongst these jump detection tests is conducted. A Monte Carlo simulation is performed using a variety of data generating processes, model parameter values and sampling frequencies. The Matthews correlation coefficient and bookmaker informedness are used to compare the absolute and relative performances of the jump detection tests. In particular, the multi-power variation tests of Barndorff-Nielsen and Shepard (2004, 2006) and Andersen *et al.* (2004), the minimum and median variance tests of Andersen *et al.* (2009), the threshold multipower variation test of Corsi *et al.* (2010), the instantaneous volatility test of Lee and Mykland (2008), the swap variance tests of Jiang and Oomen (2008) and combinations thereof are considered in the study. Generally, the absolute performances of the Lee and Mykland test are consistently strong. Consequently, it emerges as the most accurate jump detection test in most scenarios. However, when asset prices with stochastic volatility experience particularly high levels of volatility, the Lee and Mykland test experiences an inability to adequately disentangle the diffusion and jump components. The swap variance tests consistently emerge as the worst performing jump detection tests. Nevertheless, a combination of either the minimum variance and ratio swap variance tests, or the median variance and ratio swap variance tests perform notably well across the different scenarios, particularly when the volatility is high.

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In loving memory of

Anastasia.

Forever and always.

Contents

List of abbreviations

ABD	Andersen *et al.* (2004) multi-power variation test	6
ABD-RATIO	ABD and RATIO combination test	27
ACC	accuracy	19
BA	balanced accuracy	19
BMI	bookmaker informedness	21
BNS	Barndorff-Nielsen and Shepard (2004, 2006) multi-power variation test	6
BNS-RATIO	BNS and RATIO combination test	27
BPV	bi-power variation	7
CPR	Corsi *et al.* (2010) threshold multi-power variation test	11
CPR-RATIO	CPR and RATIO combination test	27
DIFF	Jiang and Oomen (2008) difference swap variance test	13
FM	Fowlkes-Mallows index	19
FN	false negative	18
FP	false positive	18
IQ	integrated quarticity	9
IS	integrated sixicity	14
IV	integrated variance	6
LM	Lee and Mykland (2008) instantaneous volatility test	15
LOG	Jiang and Oomen (2008) logarithmic swap variance test	13
MCC	Matthews correlation coefficient	21
MED	Andersen *et al.* (2009) median variance test	10
MED-RATIO	MED and RATIO combination test	27
MIN	Andersen *et al.* (2009) minimum variance test	10
MIN-RATIO	MIN and RATIO combination test	27
MPQ	multi-power quarticity	9
MPV	multi-power variation	9
NPV	negative predictive value	19
PPV	positive predictive value	19
QV	quadratic variation	6

RATIO	Jiang and Oomen (2008) ratio swap variance test	13
RV	realised variation	6
SVJJ	double jump stochastic volatility jump-diffusion model	25
TN	true negative	18
TNR	true negative rate	20
TP	true positive	18
TPR	true positive rate	19

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Chapter 1

Introduction

There is consensus in the financial literature that traded asset prices may be subject to rare, but sudden movements, resulting in asset price discontinuities, known as jumps. The seminal paper of Merton (1976) introduces jump-diffusion models; decomposing asset price dynamics into a continuous diffusion part and a discontinuous (jump) part, where the latter captures unpredictable and large price movements. The importance of incorporating this jump component into continuous-time models is well understood in the literature. Lee and Mykland (2008) explain that including a jump component allows price processes to encapsulate observed market phenomena, such as excess kurtosis and skewness of the return distribution and implied volatility smiles in option markets. Aït-Sahalia (2004) highlights that in the presence of jumps, markets are incomplete. It is therefore important to not only incorporate jumps into diffusion models, but also to disentangle the diffusion component, which can be hedged, from the jump component, which typically cannot.

The literature has shown that jumps have implications on risk management and value-at-risk calculations (see Aït-Sahalia (2004) and Duffie and Pan (2001) amongst others), derivative pricing and hedging (see Merton (1976), Bates (2000) and Eraker *et al.* (2003) amongst others), risk premia calculations (see Bollerslev and Todorov (2011) amongst others) and portfolio optimisation and asset allocation (see Aït-Sahalia and Hurd (2015) amongst others). It is therefore important to be able to identify whether jumps are present in the price process of an asset.

Jumps can vary in terms of timing, size, frequency and direction. The time series of detected jumps can be used to estimate the dynamics of the jump component. Traditionally, jump arrivals are modelled using a compound Poisson process, where jumps are assumed to be independent with a jump intensity, which may or may not be stochastic. Additionally, any correlation between the timing of jumps and scheduled macroeconomic news announcements can be investigated. An area of the jump literature has focused on this (see Lahaye *et al.* (2011) for a summary).

Since the publication of Merton's paper in 1976, numerous jump detection tests have been developed. The objective of these methodologies is to test whether asset price variability is affected by discontinuous price jumps in addition to the continuous diffusion price volatility and hence disentangle the two components. A number of parametric jump detection methodologies have been constructed, including the Implied State Generalised Method of Moments (see Pan (2002)) and the Efficient Method of Moment methodologies (see Chernov *et al.* (2003)) to name a couple. However, these methods can be computationally demanding and sensitive to model misspecification. Mancini (2001) was the first to disentangle diffusion and jump components non-parametrically. Since her work, several non-parametric jump detection tests, which make use of high-frequency intra-day data have been developed. These tests are able to detect whether a jump occurred either in a specific time interval or at a particular observation time. These tests are simple to apply and overcome the model misspecification issue of the parametric tests.

The following statistical tests are derived under asymptotic distributions as the sampling frequency tends to infinity. Barndorff-Nielsen and Shepard (2004, 2006) lay the framework for non-parametric jump detection tests that compare two measures of the quadratic variation (see Equation (2.2) for a definition), one which captures the variability of asset prices due to both diffusion and jumps and one which is robust to a finite number of jumps. The difference between these variance estimators asymptotically approaches zero if no jumps are present. Barndorff-Nielsen and Shepard (2004, 2006), Andersen *et al.* (2004), Huang and Tauchen (2005), Andersen *et al.* (2009) and Corsi *et al.* (2010) construct jump detection tests using test statistics derived from this principle. These methodologies test against the null hypothesis of no jumps detected within a specific time period, usually a trading day. The tests differ particularly with regards to how the jump-robust estimator is constructed.

Additionally, Jiang and Oomen (2008) develop jump detection tests that compare two jump-sensitive measures, both of which capture the total variability of the asset prices. The authors use the acknowledgement that the jump component cannot be hedged as the basis for their jump detection tests. These tests have the added advantage of being able to determine the jump direction.

Lee and Mykland (2008) and Andersen, Bollerslev and Diebold (2007) develop jump detection tests that are able to identify the exact number and timing of intraday jumps, as well as the size and direction of each jump detected. These jump detection tests make use of jump-robust estimators for the instantaneous volatility (see Equation (2.24) for a definition) and are implemented under the null hypothesis of no jump detected at a particular observation time.

There is no consensus in the literature that one test unanimously outperforms the others. However, Dumitru and Urga (2012), amongst others, find that combining different testing methodologies may improve the performance of these non-parametric jump detection tests, particularly with regards to reducing the number of spurious jumps detected. Schwert (2009) applies a number of non-parametric tests to empirical intra-day stock prices using a variety of sampling frequencies. The author concludes that not only does the sampling frequency influence the number and timing of jumps detected by a particular jump detection test, but also that different jump detection tests lead to different conclusions on the presence of jumps. Theodosiou and Žikeš (2011) apply several jump detection tests to both Monte Carlo simulated and empirical data and similarly find that there are significant differences in the size and power of the tests. The authors note that the jump detection tests fail to agree, across different sampling frequencies, on whether a jump occurred on a given trading day. Likewise, through an extensive Monte Carlo simulation, Dumitru and Urga (2012) observe that the performance of these finite activity jump detection tests are sensitive to features of the data generating process and the sampling frequency.

The aim of this dissertation is to compare the absolute and relative performances of existing non-parametric finite activity jump detection tests and combinations thereof, under different scenarios. The performance of each jump detection test will be measured by metrics used to evaluate binary classifiers in machine learning, namely the Matthews correlation coefficient and bookmaker informedness (see Equations (3.1) and (3.2) for definitions), as well as a combination of the two. The jump detection tests will be treated as binary classifiers with positive condition *jump* and negative condition *non-jump*. This classification rule will be applied to the asset returns processes and compared against the simulated jump times, allowing for the construction of confusion matrices. The jump detection tests will be used on high-frequency simulated data, which is generated by three data generating processes, namely the Merton constant volatility jump-diffusion model, the Bates stochastic volatility jump-diffusion model and the double jump stochastic volatility jump-diffusion model. The data will be sampled at the 30-second, 1-minute, 5-minute and 15-minute sampling frequencies. The comparison will be conducted over different model parameter values, where a number of parameters under each model are stressed one-at-a-time, while all other parameters are held constant.

The results concur with the existing literature that the jump detection tests are sensitive to the sampling frequency. Moreover, while the jump detection tests produce different absolute performances across the data generating processes; under all three data generating processes they experience similar trends across the sampling frequencies and model parameter values. In particular, the Merton and Bates models produce comparable trends. Generally, the instantaneous volatility test of Lee and Mykland (2008) produces consistently strong performances. Consequently, it emerges as the most accurate jump detection test in most scenarios. However, when asset prices with stochastic volatility experience particularly high levels of volatility, this jump detection test experiences an inability to adequately disentangle the diffusion and jump components. It becomes particularly spurious, especially under the Bates model. All the jump detection tests experience difficulty in accurately detecting small jumps in the asset prices. The jump detection tests proposed by Jiang and Oomen (2008) consistently perform poorly. Nonetheless, when combined with another jump detection test, which compares two measures of the quadratic variation, one sensitive to jumps and one robust to jumps, the combination test is notably less spurious than its constituents. These combination tests perform well across the different scenarios, at times even rivalling the performance of the Lee and Mykland (2008) test. Under the stochastic volatility jump-diffusion models, when the volatility is high, these combination tests outperform the jump detection test proposed by Lee and Mykland (2008). However, unlike the Lee and Mykland (2008) test, the combination tests cannot identify the size and exact timing of jumps, but can identify the jump direction.

The rest of this dissertation is organised as follows. Chapter 2 presents the jump detection tests, the intuition behind them and investigates their asymptotic distributions under the null hypothesis of no jumps, by making reference to the figures and tables presented in Appendix A. Chapter 3 introduces binary classifiers, metrics used to evaluate their performances and their application to jump detection tests. Chapter 4 provides details on the Monte Carlo simulation, including the data generating processes and their parameters. Furthermore, it elaborates on the methodology used to evaluate the absolute and relative performances of the jump detection tests. Following this, Chapters 5 and 6 present the results of the comparative study. They make reference to the tabulated results, which are presented in Appendices B to D. Finally, Chapter 7 concludes.

Chapter 2

Jump detection tests

In this chapter, a number of existing non-parametric jump detection tests are presented. The following is adapted from the existing literature, which compares various jump detection tests, namely Schwert (2009), Theodosiou and Žikeš (2011), Dumitru and Urga (2012) and Zoi (2017), as well as from the original papers introducing the jump detection tests.

Let $(\Omega, \mathcal{F}_t, \mathbb{P}, (\mathcal{F}_t)_t)$ be a filtered probability space upon which S_t is defined, where $\{S_t, t \geq 0\}$ is a continuous-time stochastic process describing the prices of a financial asset over time. Define $P_t := \ln S_t$ as the time t logarithmic price of the asset, which is assumed to be a semi-martingale on the filtered probability space. Therefore, assume P_t evolves as a jump-diffusion process with finite activity jumps according to the following stochastic differential equation:

$$dP_t = \mu_t dt + \sigma_t dW_t + dZ_t, \tag{2.1}$$

where μ_t is the drift process, σ_t is an adapted càdlàg volatility process and W_t is a standard Brownian motion at time t. Z_t is the jump process at time t, such that

$$dZ_t = J_t dN_t,$$

where J_t represents the random size of the price jump at time t and N_t is a finite activity counting process, representing the number of jumps up to time t, with finite intensity λ_t. It is assumed that at most one jump can occur within the time interval dt. Therefore, each increment of the discrete counting process, dN_t, follows a Bernoulli distribution with

$$\mathbb{P}(dN_t = 1) = \lambda_t dt,$$
$$\mathbb{P}(dN_t = 0) = 1 - \lambda_t dt.$$

Jump detection tests were designed to identify the discontinuous component, dZ_t, in Equation (2.1) and to conclude whether or not, over some time interval or at some particular observation time, the process dN_t is non-zero.

For all the jump detection tests described below, there are $T+1$ trading days, enumerated $t = 0, 1, \dots, T$, with equally spaced returns being sampled M times per trading day. The sampling frequency determines M.

2.1 Multi-power variation tests

Consider a single trading day $t \in [0, T]$, which corresponds to the time interval $(t-1, t]$. It is well known in the literature that the *quadratic variation* (QV) process for P_t over trading day $t \in [0, T]$ is given by

$$[P]_t = \int_{t-1}^{t} \sigma_s^2 ds + \sum_{t-1<j\leq t}^{N_t} J_j^2, \tag{2.2}$$

since the drift process $\int_{t-1}^{t} \mu_s ds$ is a continuous process of finite variation and thus has zero QV. The process $\int_{t-1}^{t} \sigma_s^2 ds$ is defined as the *integrated variance* (IV) and is the diffusion component of the QV.

Jacod and Shiryaev (1987) define the QV process for P_t over trading day $t \in [0, T]$ as

$$[P]_t := \lim_{M\to\infty} \sum_{i=1}^{M} \left(P_{t_i} - P_{t_{i-1}}\right)^2,$$

where asset prices are sampled according to partition $t_0 < t_1 < \cdots < t_M$ over the interval $(t-1, t]$ whose mesh size $\max_{1\leq i\leq M}(t_i - t_{i-1})$ converges to zero as $M \to \infty$, where M is the number of returns sampled per trading day. The i-th such return on trading day $t \in [0, T]$ is defined as

$$r_{t_i} := P_{t_i} - P_{t_{i-1}}, \qquad i = 1, 2, \dots, M. \tag{2.3}$$

In particular, if the time between successive prices, $\frac{1}{M} > 0$, is small enough, then the QV can be approximated by the *realised variation* (RV), which is defined as

$$RV_t := \sum_{i=1}^{M} r_{t_i}^2.$$

Thus, $[P]_t = \lim_{M\to\infty} RV_t$.

Furthermore, it is well known in the literature that the QV can be decomposed into a continuous component and discontinuous component, where the latter is due to jumps. Formally,

$$[P]_t = [P^c]_t + [P^d]_t, \tag{2.4}$$

where $[P^c]_t$ is a process with continuous sample paths and $[P^d]_t := \sum_{t-1\leq j\leq t} \Delta P_j^2$ is the discontinuous component.

Therefore, equating Equations (2.2) and (2.4) yields

$$[P^c]_t = \int_{t-1}^{t} \sigma_s^2 ds \quad \text{and} \quad [P^d]_t = \sum_{t-1<j\leq t}^{N_t} J_j^2.$$

Barndorff-Nielsen and Shepard (2004) introduce a partial generalisation of the QV, termed the *bi-power variation* (BPV), which can be generalised as the *multi-power variation* (MPV). The authors define the *realised BPV* as

$$MPV_t(2) := \sum_{i=2}^{M} |r_{t_i}||r_{t_{i-1}}|, \tag{2.5}$$

which converges in probability, as $M \to \infty$, to the BPV. Barndorff-Nielsen and Shepard (2004) show that

$$\lim_{M\to\infty} MPV_t(2) = \mu_1^2 \int_{t-1}^{t} \sigma_s^2 ds,$$

where

$$\mu_1 := \mathbb{E}\left[|Z|\right] = \sqrt{\frac{2}{\pi}} \text{ for } Z \sim N(0,1). \tag{2.6}$$

Intuitively, for each intra-day return consider

$$r_{t_i} \approx \mu_{t_i}\Delta t + \sigma_{t_i}\Delta W_{t_i} + \text{ jumps}.$$

Since there are only a finite number of jumps in any finite time interval, if $\frac{1}{M} = \Delta t$ is sufficiently small, then no two consecutive time intervals will both contain a jump. Therefore, when taking the limit of Equation (2.5), the effect of the jumps disappears since Δt and ΔW both tend towards zero.

Consider the product of two successive intra-day returns,

$$|r_{t_i}||r_{t_{i-1}}| \approx |\sigma_{t_i}\sigma_{t_{i-1}}||\Delta W_{t_i}\Delta W_{t_{i-1}}|,$$

since the QV of the finite variation process $\int_{t-1}^{t} \mu_s ds$ disappears in the limit. Now, consider

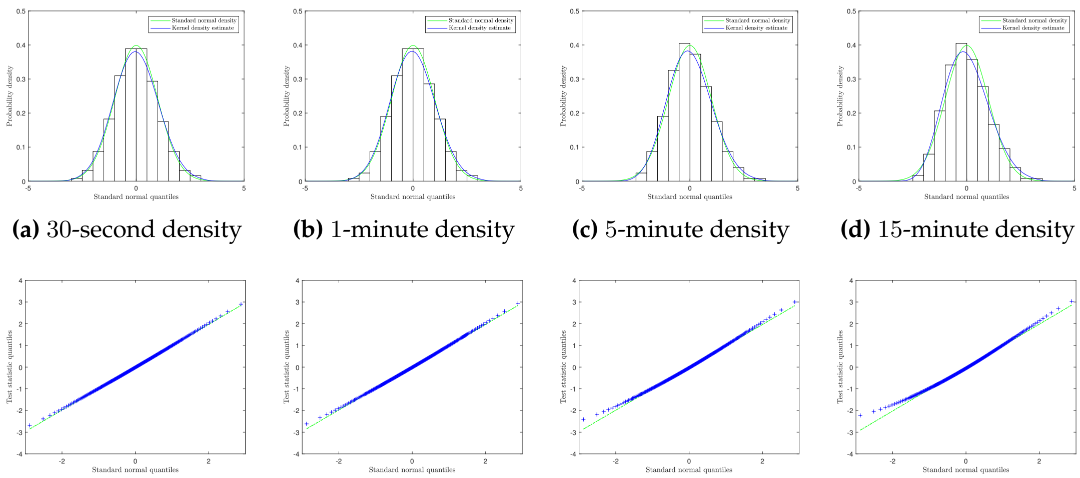
$$\mathbb{E}\left[|\Delta W_{t_i}||\Delta W_{t_{i-1}}|\right] = \mathbb{E}\left[|\Delta W_{t_i}|\right] \cdot \mathbb{E}\left[|\Delta W_{t_{i-1}}|\right] = \left(\mu_1\sqrt{\Delta t}\right)^2 = \mu_1^2\Delta t.$$

Hence, $MPV_t(2) \xrightarrow{M\to\infty} \mu_1^2 \int_{t-1}^{t} \sigma_s^2 ds$, where the convergence is in probability. It therefore follows that, as $M \to \infty$,

$$RV_t - \mu_1^{-2} MPV_t(2) \approx [P^d]_t. \tag{2.7}$$

If the left-hand-side of Equation (2.7) is large, then it is likely that there is a jump in the process P_t over trading day $t \in [0, T]$.

Barndorff-Nielsen and Shepard (2004, 2006) show that a suitably scaled version of the left-hand-side of Equation (2.7) converges in distribution to the standard normal distribution when no jumps are present in the process P_t. The authors use this to construct a one-sided statistical test to test for jumps in the process P_t over trading day $t \in [0, T]$.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 1 Distribution of the BNS test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.

Figure 1 above compares the density function and quantiles of the Barndorff-Nielsen and Shepard (2004, 2006) jump detection test statistic under the null hypothesis of no jumps to that of the standard normal distribution across four different sampling frequencies. Figure 1 proves the authors' assertion regarding the distribution of the test statistic. As the sampling frequency decreases, the test statistic becomes less akin to a standard normal random variable. This is demonstrated by the deviations at the tails of the Q-Q plot for the 15-minute sampling frequency. At this sampling frequency, the test statistic has a density with a lower peak and fatter tails than that of the standard normal distribution. Furthermore, Table 12 in Appendix A contains summary statistics for all the test statistics. This too indicates that when the volatility-of-volatility parameter is 0.27 under the Bates model (see Section 4.1.2), the test statistic follows an asymptotic standard normal distribution under the null hypothesis.

Similarly, Figure 3 and Table 13 in Appendix A show that when the volatility is high, the test statistic still follows an asymptotic standard normal distribution under the null hypothesis. However, across all the sampling frequencies, particularly, at the 5 and 15-minute sample frequencies, the test statistic shows more deviation from a standard normal random variable than when the volatility is lower.

With a null hypothesis of no jumps in a certain time interval, usually a trading day $t \in [0, T]$ and as $M \to \infty$, the general test statistic is defined as

$$Z = \frac{1 - \dfrac{MPV_t(p)}{RV_t}}{\sqrt{\theta_2 \left(\dfrac{1}{M}\right) \max\left(1, \dfrac{MPQ_t(p)}{MPV_t^2(p)}\right)}} \xrightarrow{\mathcal{D}} N(0,1), \tag{2.8}$$

where $\theta_2 = \left(\frac{\pi}{2}\right)^2 + \pi - 5$ and p is a positive integer. MPV_t is the *realised MPV* for trading day $t \in [0, T]$ and converges in probability to the IV, while MPQ_t is the *realised multi-power quarticity* (MPQ) for trading day $t \in [0, T]$ and converges in probability to the *integrated quarticity (IQ)*. Formally,

$$MPV_t(p) = \mu_{2/p}^{-p} \left(\frac{M}{M-p+1}\right) \sum_{i=p}^{M} \prod_{j=0}^{p-1} |r_{t_{i-j}}|^{2/p} \xrightarrow{M\to\infty} \int_{t-1}^{t} \sigma_s^2 ds, \tag{2.9}$$

$$MPQ_t(p) = \mu_{4/p}^{-p} \left(\frac{M^2}{M-p+1}\right) \sum_{i=p}^{M} \prod_{j=0}^{p-1} |r_{t_{i-j}}|^{4/p} \xrightarrow{M\to\infty} \int_{t-1}^{t} \sigma_s^4 ds, \tag{2.10}$$

where

$$\mu_\gamma := \mathbb{E}\left[|Z|^\gamma\right] = 2^{\gamma/2} \frac{\Gamma\left(\frac{1}{2}(\gamma+1)\right)}{\Gamma\left(\frac{1}{2}\right)} \text{ for } Z \sim N(0,1). \tag{2.11}$$

In the limit, it is expected that in the presence of jumps, $RV_t - MPV_t(p) > 0$ as shown in Equation (2.7).

As per the discussion above, Barndorff-Nielsen and Shepard (2004, 2006) recommend estimating the IV using the realised BPV, $MPV_t(2) \xrightarrow{M\to\infty} IV_t$. They further recommend using the *realised quad-power quarticity* to estimate the IQ, $MPQ_t(4) \xrightarrow{M\to\infty} IQ_t$. However, Andersen *et al.* (2004) propose using the *realised tri-power quarticity* to estimate the IQ, $MPQ_t(3) \xrightarrow{M\to\infty} IQ_t$. Huang and Tauchen (2005) found that including the maximum operator in the denominator of the test statistic improves the finite-sample performance of the test.

Figure 4 and Table 12 in Appendix A show that the test statistic for the jump detection test proposed by Andersen *et al.* (2004) follows an asymptotic standard normal distribution under the null hypothesis of no jumps. As the sampling frequency decreases, the test statistic becomes less akin to a standard normal random variable. This is demonstrated by the deviations at the tails of the Q-Q plot for the 15-minute sampling frequency. When the volatility is increased, the distributional assumption is still valid as indicated in Figure 5 and Table 13. However, as per the jump detection test proposed by Barndorff-Nielsen and Shepard (2004, 2006), across all the sampling frequencies, particularly at the 5 and 15-minute sample frequencies, the test statistic shows more deviation from a standard normal random variable than when the volatility is lower.

2.2 Minimum and median variance tests

Andersen *et al.* (2009) found that the realised MPV estimators are sensitive to market microstructure noise. They propose a different set of estimators for both the IV and IQ, based on nearest neighbour truncation. Hence, they introduce two modifications to Equation (2.9), namely, the *minimum realised variance* ($MinRV_t$) and the *median realised variance* ($MedRV_t$). These estimators are defined as

$$MinRV_t = \left(\frac{\pi}{\pi-2}\right)\left(\frac{M}{M-1}\right)\sum_{i=1}^{M-1} \min\left(|r_{t_i}|, |r_{t_{i+1}}|\right)^2,$$

$$MedRV_t = \left(\frac{\pi}{6-4\sqrt{3}+\pi}\right)\left(\frac{M}{M-2}\right)\sum_{i=2}^{M-1} \text{med}\left(|r_{t_{i-1}}|, |r_{t_i}|, |r_{t_{i+1}}|\right)^2.$$

Additionally, consistent estimators for the IQ are given by the *minimum realised quarticity* ($MinRQ_t$) and the *median realised quarticity* ($MedRQ_t$), which lead to the following modifications of Equation (2.10):

$$MinRQ_t = \left(\frac{\pi}{3\pi-8}\right)\left(\frac{M^2}{M-1}\right)\sum_{i=1}^{M-1} \min\left(|r_{t_i}|, |r_{t_{i+1}}|\right)^4,$$

$$MedRQ_t = \left(\frac{3\pi}{9\pi+72-53\sqrt{3}}\right)\left(\frac{M^2}{M-2}\right)\sum_{i=2}^{M-1} \text{med}\left(|r_{t_{i-1}}|, |r_{t_i}|, |r_{t_{i+1}}|\right)^4.$$

Combinations of these consistent estimators can be used to construct test statistics, which lead to more powerful tests than those proposed by Barndorff-Nielsen and Shepard (2004, 2006). Andersen *et al.* (2009) found that the $MinRV_t$ and $MedRV_t$ estimators eliminate large absolute returns associated with jumps, making them more robust to jumps than the MPV_t and are therefore more appropriate to be used as IV estimators. The following test statistics were constructed under the null hypothesis of no jumps in a certain time interval, usually a trading day $t \in [0, T]$

and as $M \to \infty$,

$$Z_{\text{min}} = \frac{1 - \dfrac{MinRV_t}{RV_t}}{\sqrt{1.81\left(\dfrac{1}{M}\right)\max\left(1, \dfrac{MinRQ_t}{MinRV_t^2}\right)}} \xrightarrow{\mathcal{D}} N(0,1), \tag{2.12}$$

$$Z_{\text{med}} = \frac{1 - \dfrac{MedRV_t}{RV_t}}{\sqrt{0.96\left(\dfrac{1}{M}\right)\max\left(1, \dfrac{MedRQ_t}{MedRV_t^2}\right)}} \xrightarrow{\mathcal{D}} N(0,1). \tag{2.13}$$

Figures 6 and 8 and Table 12 in Appendix A show that both test statistics follow an asymptotic standard normal distribution under the null hypothesis of no jumps. Similarly, when the volatility is increased, this still holds true as indicated in Figures 7 and 9 and Table 13. The distribution of these test statistics, when no jumps are present, show the least variation from the standard normal distribution when the volatility is increased.

2.3 Threshold multi-power variation test

Mancini (2009), following on from her earlier work, shows that a threshold estimator of the IV, is more efficient than the MPV estimators in identifying intervals in which jumps occurred. Corsi *et al.* (2010) construct a jump detection test that combines the MPV estimator proposed by Barndorff-Nielsen and Shepard (2006) with the threshold estimator proposed by Mancini (2009). The authors suggest a *corrected realised threshold multi-power variation* estimator for the IV, $(cMPV_t)$ and a *corrected realised threshold multi-power quarticity* estimator for the IQ, $(cMPQ_t)$. Therefore, Equations (2.9) and (2.10) are modified as follows:

$$cMPV_t(p) = \mu_\gamma^{-p}\left(\frac{M}{M-p+1}\right)\sum_{i=p}^{M}\prod_{j=0}^{p-1} Q\left(r_{t_{i-j}}, \vartheta_{t_{i-j}}\right), \tag{2.14}$$

$$cMPQ_t(p) = \mu_\gamma^{-p}\left(\frac{M^2}{M-p+1}\right)\sum_{i=p}^{M}\prod_{j=0}^{p-1} Q\left(r_{t_{i-j}}, \vartheta_{t_{i-j}}\right), \tag{2.15}$$

respectively, where μ_γ is defined in Equation (2.11). The threshold $\vartheta_{t_i} = c_\vartheta^2 \hat{V}_{t_i}^\zeta$ is a constant multiple of the local variance, which is estimated by a local linear filter that removes jumps in several iterations. Corsi *et al.* (2010) recommend setting $c_\vartheta = 3$ and using a filter of length $2L+1$, with $L = 25$, but the choice of L is not crucial. L is the number of adjacent intra-day returns included in the estimate of the local variance at each observation time t_i for $i \in [L+1, M-L]$ for each trading day $t \in [0, T]$. However, the adjacent observations at and around t_i are not used in the estimation ($j \neq -1, 0, 1$ in Equation (2.16)). Therefore, the local variance is estimated by the following non-parametric filter, presented in Fan and Yao (2003), which is adjusted for jumps by iterating in ζ,

$$\hat{V}_{t_i}^{\zeta} = \frac{\sum_{j=-L, j\neq -1,0,1}^{L} K\left(\frac{j}{L}\right) \left(r_{t_{i+j}}\right)^2 I_{\left\{\left(r_{t_{i+j}}\right)^2 \leq c_V^2 \hat{V}_{t_{i+j}}^{\zeta-1}\right\}}}{\sum_{j=-L, j\neq -1,0,1}^{L} K\left(\frac{j}{L}\right) I_{\left\{\left(r_{t_{i+j}}\right)^2 \leq c_V^2 \hat{V}_{t_{i+j}}^{\zeta-1}\right\}}}. \tag{2.16}$$

Here, ζ is an integer representing the iteration number, where $\zeta = 0$ corresponds to using all the observations in the data and hence $\hat{V}_{t_i}^0 = +\infty$ and $c_V = 3$. Over each trading day $t \in [0, T]$, $\hat{V}_{t_i}^{\zeta} = +\infty$ for $i \in [1, L]$ and $i \in [M-L+1, M]$. The function $K(\cdot)$ is the Gaussian kernel given by $K(x) = \left(\frac{1}{\sqrt{2\pi}}\right) \exp\left(-\frac{x^2}{2}\right)$. Additionally,

$$Q(x, y) = \begin{cases} |x|^{\gamma} & \text{if } x^2 \leq y, \\ \frac{1}{2M(-c_{\vartheta})\sqrt{\pi}} \left(\frac{2}{c_{\vartheta}^2} y\right)^{\gamma/2} \Gamma\left(\frac{\gamma+1}{2}, \frac{c_{\vartheta}^2}{2}\right) & \text{if } x^2 > y, \end{cases} \tag{2.17}$$

where $\Gamma(\alpha, x)$ is the upper incomplete gamma function and γ is an integer. Corsi *et al.* (2010) construct their test around the idea that in order to remove the bias associated with the MPV when jumps are present, it is necessary to truncate large absolute returns, with the cut-off being the threshold ϑ_{t_i}. Therefore, they start constructing their test by multiplying Equation (2.9) by the indicator function $I_{\{|r_{t_{i-j}}|^2 \leq \vartheta_{t_{i-j}}\}}$. However, this may introduce zero returns and thus negative bias; therefore, the absolute squared returns that exceed the threshold are replaced with their expected value under the null hypothesis of no jumps. The function $Q(x, y)$ serves this purpose.

Corsi *et al.* (2010) recommend using the *corrected realised threshold bi-power variation* to estimate the IV, $cMPV_t(2) \xrightarrow{M\to\infty} IV_t$ with $\gamma = 1$ and the *corrected realised tri-power quarticity* to estimate the IQ, $cMPQ_t(3) \xrightarrow{M\to\infty} IQ_t$ with $\gamma = \frac{4}{3}$.

Figure 10 and Table 12 in Appendix A show that the test statistic follows an asymptotic standard normal distribution under the null hypothesis of no jumps. Similarly, when the volatility is increased, this still holds true as indicated in Figure 11 and Table 13. However, across all sampling frequencies the test statistic shows more deviation from a standard normal random variable than when the volatility is lower. This is demonstrated by the deviation at the tails of the Q-Q plots and the notably lower peaked and fatter tailed density of the test statistic when compared to the standard normal density.

2.4 Swap variance tests

Jiang and Oomen (2008) took a different approach to constructing jump detection tests, looking at the problem from a hedging perspective. The literature highlights that a replication strategy to hedge an asset price process with a discontinuous component will contain a stochastic and unhedgeable error (see Neuberger (1994) amongst others). Therefore, in order to test for the presence of jumps in an asset price process, Jiang and Oomen (2008) consider the error that is present when a log contract is used to delta hedge a variance swap. The authors proceed as follows. Jiang and Oomen (2008) define the mean of the price jump process, J_t, as $\exp(J_t)-1$ and consider the difference between the dynamics of the asset price process, $\{S_t, t \in [0,T]\}$ and the logarithmic asset prices, $\{P_t, t \in [0,T]\}$. Resultantly, they arrive at the following equation:

$$2\int_{t-1}^{t}\left(\frac{dS_s}{S_s} - dP_s\right) = \int_{t-1}^{t}\sigma_s^2 ds + 2\int_{t-1}^{t}\left(\exp(J_s) - J_s - 1\right) dN_s. \tag{2.18}$$

The authors go on to describe that the left-hand-side of Equation (2.18) can be interpreted in a financial sense as the cumulative gains on a continuously re-balanced delta hedge of two short log contracts initiated at $t-1$ with maturity t and terminal payoff $\ln\left(\frac{S_t}{S_{t-1}}\right)$. Jiang and Oomen (2008) note that $\frac{dS_s}{S_s}$ is synonymous with the instantaneous gain of a delta position in the underlying asset. If jumps are not present in the asset price process then the second term on the right-hand-side of Equation (2.18) falls away and the remaining terms lead to the acknowledgement that a variance swap can be perfectly replicated by a delta hedged log contract, provided the underlying asset has a purely continuous price process. Hence, $2\int_{t-1}^{t}\left(\exp(J_s) - J_s - 1\right) dN_s$ can be defined as the unhedgeable error in the replication strategy.

The authors then consider a discretisation of the left-hand-side of Equation (2.18), which they term the *swap variance* and define as

$$SwV_t := 2\sum_{i=1}^{M}\left(R_{t_i} - r_{t_i}\right) = 2\sum_{i=1}^{M} R_{t_i} - 2\ln\left(\frac{S_t}{S_{t-1}}\right),$$

where r_{t_i} is the i-th intra-day geometric return on trading day $t \in [0,T]$ and defined in Equation (2.3), while $R_{t_i} := \frac{S_{t_i} - S_{t_{i-1}}}{S_{t_{i-1}}}$ is the i-th arithmetic return on trading day $t \in [0,T]$. Then, as $M \to \infty$, if no jumps are present, the swap variance converges in probability to the RV. Formally, in the time interval $(t-1, t]$

$$SwV_t - RV_t \xrightarrow{M\to\infty} \begin{cases} 0 & \text{if no jumps,} \\ 2\int_{t-1}^{t}\left(\exp(J_s) - J_s - 1\right) dN_s - \int_{t-1}^{t} J_s^2 dN_s & \text{if jumps.} \end{cases}$$

The jump detection tests presented by Jiang and Oomen (2008) therefore differ from those described above in that they compare a jump-sensitive measure, the swap variance, to the RV. Using a Taylor series expansion of $SwV_t - RV_t$, Jiang and Oomen (2008) show that the swap variance jump detection tests take advantage of jump impacts on the third and higher moments of asset returns. Additionally, these tests are able to determine the direction of the jump, i.e. positive or negative and are thus two-sided statistical tests unlike the jump detection tests described above. For the null hypothesis of no jumps over trading day $t \in [0, T]$ and when $M \to \infty$, Jiang and Oomen (2008) construct three test statistics, namely the difference, logarithmic and ratio test statistics.

$$\text{Difference:} \quad JO_{\text{diff}} = \frac{M}{\sqrt{\Omega_t(p)}} (SwV_t - RV_t) \xrightarrow{\mathcal{D}} N(0,1), \tag{2.19}$$

$$\text{Logarithmic:} \quad JO_{\text{log}} = \frac{MPV_t(2)M}{\sqrt{\Omega_t(p)}} \Big(\ln(SwV_t) - \ln(RV_t) \Big) \xrightarrow{\mathcal{D}} N(0,1), \tag{2.20}$$

$$\text{Ratio:} \quad JO_{\text{ratio}} = \frac{MPV_t(2)M}{\sqrt{\Omega_t(p)}} \left(1 - \frac{RV_t}{SwV_t} \right) \xrightarrow{\mathcal{D}} N(0,1), \tag{2.21}$$

where the latter two make use of the realised BPV defined in Equation (2.9) with $p = 2$. $\Omega_t(p)$ is a scaled estimator of the *integrated sixicity* (IS), $\int_{t-1}^{t} \sigma_s^6 ds$. For trading day $t \in [0, T]$, the *realised multi-power sixicity* (MPS_t) converges in probability to the IS as $M \to \infty$. Therefore, the authors propose the following:

$$MPS_t(p) = \mu_{6/p}^{-p} \left(\frac{M^3}{M - p + 1} \right) \sum_{i=p}^{M} \prod_{j=0}^{p-1} |r_{t_{i-j}}|^{6/p} \xrightarrow{M \to \infty} \int_{t-1}^{t} \sigma_s^6 ds,$$

and

$$\Omega_t(p) = \frac{\mu_6}{9} MPS_t(p) \tag{2.22}$$

and recommend using either $p = 4$ or $p = 6$. The term $\mu_\cdot$ is defined in Equation (2.11).

Figures 12, 14 and 16 and Table 12 in Appendix A show that all three test statistic follow an asymptotic standard normal distribution under the null hypothesis of no jumps when the volatility-of-volatility parameter is 0.27 under the Bates model (see Section 4.1.2). However, these jump detection tests show the most deviation from a standard normal random variable when compared to the other jump detection tests. In particular, the test statistics have notably lower peaked and fatter tailed distributions, which are more prominent at the 5 and 15-minute sampling frequencies. At these lower sampling frequencies, these jump detection tests have a kurtosis higher than 3 and their Q-Q plots show significant deviations at the tails, particularly for the difference jump detection test.

When the volatility is increased, across all sampling frequencies, the test statistics show more deviation from a standard normal random variable than when the volatility is lower. This is particularly true for the 5 and 15-minute sampling frequencies. See Figures 13, 15 and 17 and Table 13. At the 30-second and 1-minute sampling frequency, all three test statistics appear to follow a standard normal distribution under the null hypothesis of no jumps. However, at the 5 and 15-minute sampling frequencies, this is not the case. The Kolmogorov-Smirnov goodness of fit test concludes that for all three test statistics the null hypothesis, that they follow a standard normal distribution, is rejected. This is demonstrated by the large deviations between the quantiles of the standard normal distribution and those of the test statistics. Furthermore, when no jumps are present, the density for each test statistic at high volatilities, is significantly less peaked and fatter tailed than that of a standard normal random variable.

2.5 Instantaneous volatility tests

The jump detection tests described above are unable to detect the exact timing and size of jumps. Lee and Mykland (2008) and Andersen, Bollerslev and Dobrev (2007) develop non-parametric jump detection tests that overcome this drawback. These tests identify the exact timing, direction and size of intra-day jumps by checking for jumps at each individual observation. Therefore, instead of considering each trading day these tests consider each observation, where there are $M \times 252 \times T$ observations in total. M is the number of returns sampled in a trading day, 252 is the number of trading days in a year and T is the number of years. Going forward assume $T = 1$. A slightly different notation will be used than what was utilised above. Consider all the times at which there are observations, i.e. asset returns, which can be enumerated $\tau_1, \tau_2, \ldots, \tau_{M\times 252}$. These times are equally spaced.

Lee and Mykland (2008) note that when prices are observed at discrete times, it is difficult to distinguish between high volatility and a jump in the asset price process, when the observed realised asset return is greater than expected at a particular point in time. In an attempt to disentangle these phenomena, the authors propose standardising the realised asset return by a quantity that explains the local variation from the continuous component of the asset price process only, the *instantaneous volatility*. Hence, at observation time τ_ℓ, Lee and Mykland (2008) standardise the intra-day return of the logarithmic prices, r_{τ_ℓ}, by an estimate for the instantaneous volatility, $\hat{\sigma}_{\tau_\ell}$, which is robust to jumps. Formally, the test statistic used to test whether there is a jump in $(\tau_{\ell-1}, \tau_\ell]$ is defined as follows:

$$\mathcal{L}(\tau_\ell) = \frac{r_{\tau_\ell}}{\hat{\sigma}_{\tau_\ell}}, \tag{2.23}$$

where $r_{\tau_\ell} := P_{\tau_\ell} - P_{\tau_{\ell-1}}$ for $\ell = 1, \dots, M \times 252$. The corresponding null hypothesis is that no jump is present in the asset price process at particular observation τ_ℓ.

Lee and Mykland (2008) construct an estimator for the instantaneous volatility using a number of past returns, which may span over a number of trading days. In order to determine whether a jump is present over a given trading day, the other jump detection tests described above only make use of the returns sampled for that specific trading day. Lee and Mykland (2008) define the estimate for the instantaneous variance at time τ_ℓ as follows:

$$\hat{\sigma}^2_{\tau_\ell} = \left(\frac{1}{K-2}\right) \sum_{j=\ell-K+2}^{\ell-1} |r_{\tau_j}||r_{\tau_j - 1}|, \tag{2.24}$$

which is a scaling of the realised BPV calculated over a time window of size K, which is chosen such that the instantaneous volatility estimator is robust to jumps. Lee and Mykland (2008) recommend choosing $K = \sqrt{252 \times M}$, where K is a positive integer and depends on the sampling frequency through M. This jump detection test cannot test for a jump at the first $K - 1$ observations.

$\mathcal{L}(\tau_\ell)$ is asymptotically normally distributed under the null hypothesis with mean 0 and variance $\frac{1}{\mu_1^2}$, where μ_1 is defined in Equation (2.6). Therefore, Andersen, Bollerslev and Dobrev (2007) proposed comparing $\mathcal{L}(\tau_\ell)$ to some normal threshold. Multiple testing problems may occur since $\mathcal{L}(\tau_\ell)$ is applied multiple times within each trading day. Andersen, Bollerslev and Dobrev (2007) argue that making use of the Šidák approach helps deal with some of these problems. First select a daily size α, which leads to the size of each intra-day test being $\beta = 1 - (1-\alpha)^{1/M}$. Then, reject the null hypothesis if $\mathcal{L}(\tau_\ell) > \Phi_{1-\beta/2}$, where $\Phi_{1-\beta/2}$ denotes the $(1-\beta/2)$-quantile of the standard normal distribution.

Andersen, Bollerslev and Dobrev (2007) highlight that when there is a large amount of intra-day variation in the volatility, this approach tends to overestimate the number of jumps detected. They found satisfactory performance of the test when $\alpha = 10^{-5}$. Lee and Mykland (2008) use another approach all together. The authors recommend using the critical values from the limiting distribution of the maximum of $\mathcal{L}(\tau_\ell)$. When $M \to \infty$, this maximum converges to a Gumbel distribution. Let $\bar{A}_n$ be the set of all observation times, then

$$L(\tau_\ell) = \frac{\max_{\tau_\ell \in \bar{A}_n} |\mathcal{L}(\tau_\ell)| - C_n}{S_n} \xrightarrow{\mathcal{D}} \xi, \quad \mathbb{P}\left(\xi \le x\right) = \exp(-e^{-x}),$$

where

$$C_n = \frac{\sqrt{2\log(n)}}{\mu_1} - \frac{\log(\pi) + \log(\log(n))}{2\mu_1\sqrt{2\log(n)}} \quad \text{and} \quad S_n = \frac{1}{\mu_1\sqrt{2\log(n)}},$$

where $n = M \times 252$ is the total number of observations and μ_1 is defined in Equation (2.6). Then, for a given significance level α, the null hypothesis is rejected if $\frac{|\mathcal{L}(\tau_\ell)| - C_n}{S_n} > -\log\left(-\log\left(1-\alpha\right)\right)$.

This jump detection test is more spurious when the instantaneous volatility changes quickly. Bormetti *et al.* (2015) attempt to correct the upward bias in favour of jumps by constructing an estimator based on the threshold BPV, which uses an exponential moving average to weight past observations and excludes observations exceeding a specified threshold.

Chapter 3

Binary classifiers: evaluation metrics and application to jump detection tests

In this chapter, a brief discussion on binary classifiers and the metrics used to evaluate their performances is presented. Additionally, their application to jump detection tests is discussed in Section 3.4.

A *binary classifier* dichotomously arranges data according to a classification rule. The performance of such is evaluated by comparing the output of the classifier against a reference classification, such as a perfect classification or a gold standard test (Powers (2011)).

3.1 Confusion matrix

Powers (2011) explains that the output of a binary classifier can be represented as *positives*, indicating the presence of a condition or characteristic and *negatives*, indicating the absence of a condition or characteristic. The output of the classifier and the reference classification is cross tabulated in a 2×2 contingency table, referred to as a *confusion matrix*, illustrated in Table 1 below. The red cells depict the classifier's incorrect classifications, while the green cells depict the classifier's correct classifications.

Table 1 Confusion matrix.

	Predicted condition	
Actual condition	True positive	False negative
	False positive	True negative

A *true positive* (TP) is when the classifier correctly predicts the presence of a condition or characteristic. When the classifier incorrectly predicts the presence of a condition or characteristic, it is called a *false positive* (FP). Similarly, a *true negative* (TN) is when the classifier correctly predicts the absence of a condition or characteristic. When the classifier incorrectly predicts the absence of a condition or characteristic, it is called a *false negative* (FN).

3.2 Common performance metrics

Using the confusion matrix above, the following metrics can be derived.

The precision of the classifier, also referred to as the *positive predictive value* (PPV), considers how many of the identified positive instances are actual positive conditions. The *negative predictive value* (NPV), considers how many of the identified negative instances are actual negative conditions. Formally,

$$PPV = \frac{TP}{TP + FP},$$

$$NPV = \frac{TN}{TN + FN}.$$

These metrics have values ranging from 0 to $+1$. The closer these metrics are to $+1$, the more accurate the classifier. However, Altman and Bland (1994) note that both these metrics are sensitive to the *prevalence*, which is defined as the proportion of actual positive instances to the total number of instances. In a balanced dataset, the prevalence will be approximately 50%. The PPV is directly proportional to the prevalence, while the NPV is indirectly proportional. This can lead to distorted results for imbalanced datasets. Class imbalances is a key issue in the classification literature and has therefore received much attention. Luque *et al.* (2019) conduct an extensive investigation into the impact that prevalence has on a number of metrics used to evaluate binary classifiers. Daskalaki *et al.* (2006) and Branco *et al.* (2017) carry out independent studies into metrics that overcome the difficulties presented by class imbalances.

The sensitivity or recall of the classifier, also referred to as the *true positive rate* (TPR) is the proportion of instances that have the condition or characteristic that are classified as such. Conversely, the specificity of the classifier, also referred to as the *true negative rate* (TNR) is the proportion of instances that do not have the condition or characteristic that are classified as such. Formally,

$$TPR = \frac{TP}{TP + FN},$$

$$TNR = \frac{TN}{FP + TN}.$$

These metrics have values ranging from 0 to $+1$. The closer these metrics are to $+1$, the more accurate the classifier. The TPR and TNR are prevalence-independent performance metrics.

In addition to the above, the *accuracy* (ACC) of the classifier can be computed. This measures the proportion of instances that are correctly classified as either positive or negative. Chawla (2005) notes the ACC is prevalence-dependent and therefore may be an inappropriate metric to use to evaluate binary classifiers applied to imbalanced datasets. The *balanced accuracy* (BA) was therefore defined for imbalanced datasets. It takes the arithmetic mean of the TPR and TNR of the classifier. Formally,

$$ACC = \frac{TP + TN}{TP + FN + FP + TN},$$

$$BA = \frac{TPR + TNR}{2}.$$

Furthermore, the *F_1-score* and *Fowlkes-Mallows index* (FM) are other metrics used to evaluate the performance of a binary classifier. The former is simply the harmonic mean of the PPV and TPR of the classifier. However, both metrics exclude the true negatives in their computation, resulting in them being misleading in imbalanced datasets as identified in the literature (see Luque *et al.* (2019) for example). Formally, these metrics can be expressed as

$$F_1 = 2\left(\frac{PPV \times TPR}{PPV + TPR}\right),$$

$$FM = \sqrt{PPV \times TPR}.$$

3.3 Other performance metrics

Luque *et al.* (2019) conclude that the PPV, NPV and F_1-score should not be used with imbalanced datasets due to their high prevalence-biases. Chicco and Jurman (2020) note that while the ACC and F_1-score are widely reported performance metrics, they tend to state results as being over-optimistic. This is particularly true for imbalanced datasets. They propose using the *Matthews correlation coefficient* (MCC) instead. The MCC only produces a high score if the classifier performs well across all quadrants of the confusion matrix. Additionally, Chicco *et al.* (2021) highlight that the MCC produces the same result if the positive class is renamed as the negative class and vice versa. This is not the case for the PPV, NPV and F_1-score.

Chicco *et al.* (2021) note that the MCC measures the correlation between the actual instances and the classifier's predictions; thus, evaluating the quality of the binary classifier. The interpretation of the MCC is akin to that of the Pearson correlation coefficient. It returns values from -1 to $+1$, where -1 suggests complete disagreement between the classifier's predictions and the observed instances, 0 indicates that the classifier is comparable to random prediction and $+1$ suggests perfect classification. Formally, it can be expressed as

$$MCC = \frac{TP \times TN - FP \times FN}{\sqrt{(TP + FP)\,(TP + FN)\,(TN + FP)\,(TN + FN)}}. \tag{3.1}$$

Powers (2003) motivates an alternative metric, termed the *bookmaker informedness* (BMI), by using a horse racing betting scenario, which penalises incorrect bets, which are based on fair odds computed from historical data. See Powers (2003) for the detailed explanation. The BMI measures how informed a classifier is with regards to a condition or characteristic. That is, it considers the proportion of informed decisions made by the classifier, as compared to random guessing. Powers (2011) notes that this metric overcomes the prevalence-bias. Moreover, Luque *et al.* (2019) conclude that the BMI is the best unbiased metric for binary classifier evaluation. Formally, it can be expressed as

$$BMI = TPR + TNR - 1. \tag{3.2}$$

Its values range from -1 to $+1$, with 0 indicating poor performance by the classifier, akin to random guessing and $+1$ suggesting perfect performance.

Both the MCC and BMI utilise all quadrants of the confusion matrix; therefore, they give a well-rounded indication of a classifier's performance.

3.4 Application to jump detection tests

The jump detection tests are akin to binary classifiers with positive condition *jump* and negative condition *non-jump*. Therefore, this classification rule can be used to determine whether or not a jump detection test detects a jump in the asset price process over a trading day or at a particular observation time. The output from each jump detection test is compared against perfect classification, which is the times of the actual simulated jumps. Table 2 below displays the confusion matrix for these binary classifiers.

Table 2 Confusion matrix for jump detection tests.

	Predicted jump	
Actual jump	Jump correctly detected	Non-jump incorrectly detected
	Jump incorrectly detected	Non-jump correctly detected

Consequently, the common performance metrics defined in Section 3.2 can be applied to jump detection tests as follows. The PPV is the proportion of detected jumps that are simulated jumps. The NPV is the proportion of detected non-jumps that are simulated non-jumps. The TPR is the proportion of simulated jumps that are correctly classified as such. The TNR is the proportion of simulated non-jumps that are correctly classified as such.

Jumps in asset prices are rare (see Merton (1976) for example). It is thus expected that the jump detection binary classifiers will be applied to imbalanced datasets, with significantly more non-jumps than jumps. Hence, the data has a low prevalence. The prevalence-sensitive metrics described above would therefore result in misleading conclusions regarding the performance of the jump detection tests. For example, the low prevalence naturally reduces each jump detection tests' PPV, indicating that the tests perform poorly. Consequently, it is imperative that prevalence-insensitive metrics be used in order to accurately measure the performances of the jump detection tests.

Chapter 4

Comparative study design

In this chapter, details that underpin the comparative study design are presented.

An Euler Monte Carlo simulation is performed to generate $1\ 000$ sample paths of the asset price process over a trading year with 252 days, consisting of 6.5 hours each and 1 second time steps. The prices are simulated according to the three data generating processes presented in Section 4.1, which are parametrised as outlined in Section 4.2. The price data is converted into high-frequency returns data, sampled at the 30-second, 1-minute, 5-minute and 15-minute sampling frequencies. The former two are referred to as the higher sampling frequencies and the latter two the lower sampling frequencies. The jump detection tests, specified in Section 4.3, are used to detect the simulated jumps. The performances of these tests are captured, analysed and compared as outlined in Section 4.4.

4.1 Data generating processes

Let $(\Omega, \mathcal{F}_t, \mathbb{P}, (\mathcal{F}_t)_t)$ be a filtered probability space upon which S_t is defined, where $\{S_t, t \geq 0\}$ is a continuous-time stochastic process describing the prices of a financial asset over time. Assume that S_t evolves as a jump-diffusion process. For the purpose of this dissertation, the difference between the physical/real-world and risk-adjusted measures is ignored when simulating asset price paths.

4.1.1 Merton constant volatility jump-diffusion model

Merton (1976) introduces the constant volatility jump-diffusion model, the Merton model, which is an extension of the Black and Scholes (1973) formula. Specifically, a random jump component is included in the price process. S_t evolves according to the following stochastic differential equation:

$$\frac{dS_t}{S_{t-}} = (r - \lambda\mu_J)\, dt + \sigma_V dW_t^S + J_t dN_t,$$

where S_{t-} represents the pre-jump value of the price process of the underlying asset, r is the risk-free interest rate, σ_V^2 is the constant variance of the underlying asset, W_t^S is a continuous-time standard Brownian motion and process N_t represents a Poisson process with constant jump intensity λ. Andersen *et al.* (2002) and Chernov *et al.* (2003) both find no concrete affirmation that the jump intensity is time dependent, while Bates (2000) finds that models with state-dependent jump intensities are often misspecified; therefore, a constant jump intensity is used in this dissertation. The random jump sizes, J_t, follow a Gaussian process such that

$$1 + J_t \sim \mathcal{LN}\left(\mu_S, \sigma_S^2\right), \tag{4.1}$$

where μ_J and μ_S have the following relationship:

$$\mu_J = \exp\left(\mu_S + \frac{1}{2}\sigma_S^2\right) - 1. \tag{4.2}$$

Refer to Duffie *et al.* (2000) for a derivation of the above relationship. The jumps are independent of each other and of processes W_t^S and N_t, such that $J_t dN_t$ defines a compound Poisson process.

4.1.2 Bates stochastic volatility jump-diffusion model

Bates (2000) introduces the stochastic volatility jump-diffusion model, the Bates model, which is an extension of the Heston (1993) model. As per the Merton (1976) model, a random jump component is included in the price process only. S_t evolves according to the following stochastic differential equations:

$$\begin{aligned} \frac{dS_t}{S_{t-}} &= (r - \lambda\mu_J)\, dt + \sqrt{V_t} dW_t^S + J_t dN_t, \\ dV_t &= \kappa\,(\theta - V_t)\, dt + \sigma_V \sqrt{V_t} dW_t^V, \end{aligned}$$

where S_{t-} represents the pre-jump value of the price process of the underlying asset, r is the risk-free interest rate, V_t is the variance process of the underlying asset, W_t^S and W_t^V are continuous-time correlated Brownian motions, such that $dW_t^S dW_t^V = \rho dt$. Process N_t represents a Poisson process with jump intensity λ. The parameters κ, θ and σ_V are constants, which represent the mean reversion rate, mean reversion level and volatility of the variance process, respectively. Additionally, the random jump sizes, J_t, are as per the distribution in (4.1) with μ_J calculated as per Equation (4.2). Similarly to the Merton model, $J_t dN_t$ defines a compound Poisson process, with the jumps independent of each other as well as of processes W_t^S, W_t^V and N_t.

4.1.3 Double jump stochastic volatility jump-diffusion model

The Bates model can further be extended to include jumps in both the price and variance processes. Duffie *et al.* (2000) present the dynamics for a stochastic volatility jump-diffusion model with simultaneous and correlated jumps in the price and variance processes, termed the SVJJ model. Bakshi *et al.* (1997), Broadie *et al.* (2007) and Gatheral (2011) have done further research on such models. Duffie *et al.* (2000) note that the price jumps depend on the size of jumps in the variance process through the jump correlation parameter, ρ_J and suggest that S_t evolves according to the following stochastic differential equations:

$$\frac{dS_t}{S_{t-}} = (r - \lambda\mu_J)\, dt + \sqrt{V_{t-}} dW_t^S + J_t dN_t,$$
$$dV_t = \kappa\,(\theta - V_{t-})\, dt + \sigma_V \sqrt{V_{t-}} dW_t^V + Z_t dN_t,$$

where S_{t-}, r, V_t, W_t^S, W_t^V, N_t, κ, θ and σ_V are as per the Bates model in Section 4.1.2 and V_{t-} represents the pre-jump value of the variance process of the underlying asset. The jumps in the variance and price processes are defined as follows:

$$Z_t \sim \text{Exp}\,(\mu_V)\,,$$
$$1 + J_t \mid Z_t \sim \mathcal{LN}\left(\mu_S + \rho_J Z_t, \sigma_S^2\right),$$

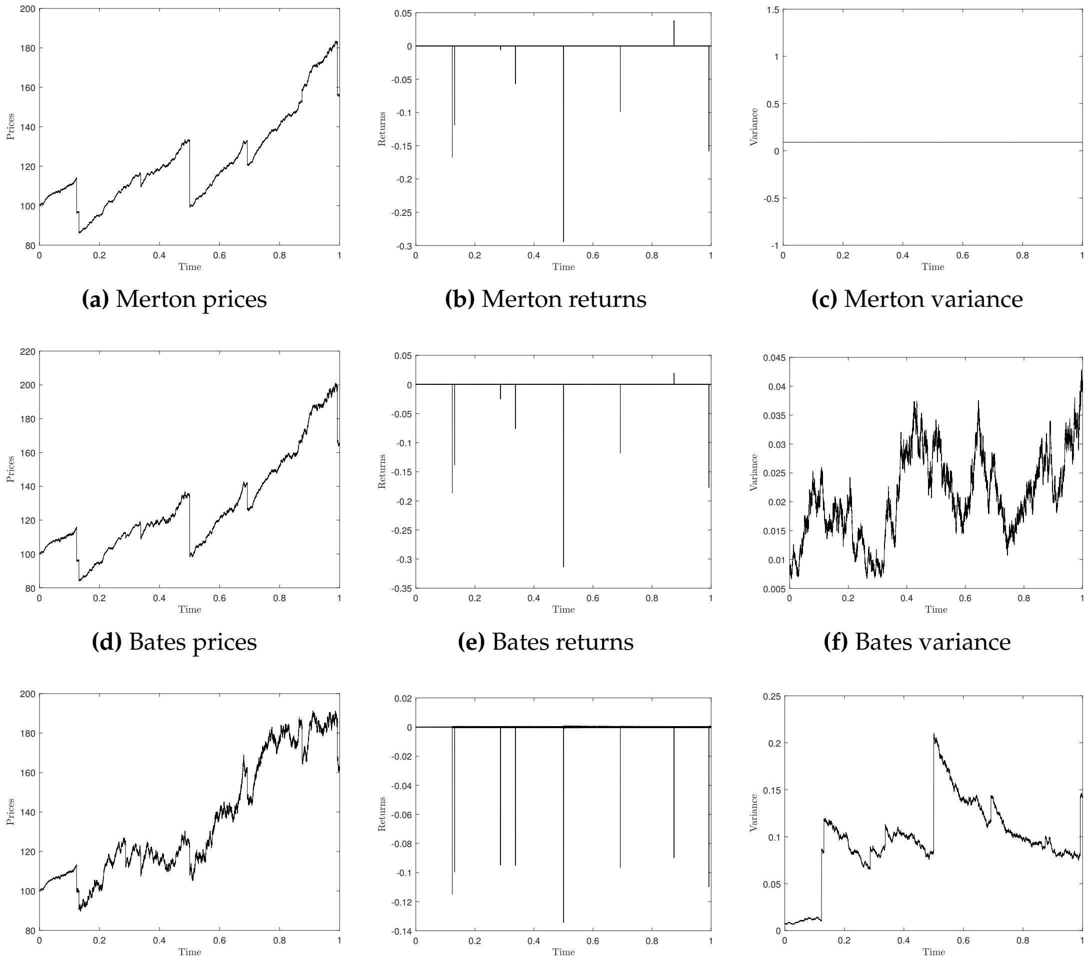
respectively, where $J_t dN_t$ defines a compound Poisson process. Duffie *et al.* (2000) derive the relationship between μ_J, μ_V and μ_S, which is specified as follows:

$$\mu_J = \frac{\exp\left(\mu_S + \frac{1}{2}\sigma_S^2\right)}{1 - \rho_J\mu_V} - 1.$$

Figures 2a, 2d and 2g below display a sample price path for the Merton, Bates and SVJJ models, respectively, using the calibrated parameters in Section 4.2. Similarly, Figures 2b, 2e and 2h display the returns for each model. These Figures highlight the jumps in the asset returns. Figures 2c, 2f and 2i display the constant variance under the Merton model, the stochastic variance with no jumps under the Bates model and the stochastic variance with jumps under the SVJJ model, respectively.

4.2 Parameters

Duffie *et al.* (2000) calibrate the Bates and SVJJ models to S&P 500 index option prices obtained from market data on 2 November 1993 by minimising the mean-squared pricing error, defined as the average of the squared differences between



(a) Merton prices **(b)** Merton returns **(c)** Merton variance

(d) Bates prices **(e)** Bates returns **(f)** Bates variance

(g) SVJJ prices **(h)** SVJJ returns **(i)** SVJJ variance

Figure 2 Simulated asset prices, returns and variances under the Merton, Bates and SVJJ models.

the observed and predicted option prices across all maturities and strike prices. Similarly, Tankov and Voltchkova (2009) calibrate the Merton model to S&P 500 index option prices by minimising the squared norm between the observed and predicted option prices across four different maturities. Table 3 below displays the calibrated parameter values. These are used in the simulation together with an initial asset price of 100, risk-free interest rate of 0.1 and an assumption of no dividends. The calibrated jump intensities are too low for the purposes of this study, which is to detect jumps; therefore, for each model the jump intensity is set to 12, one jump per month.

Consider each model and sampling frequency combination. One-at-a-time, the values of the variable parameters, displayed in Table 3, are randomly stressed,

Table 3 Constant and variable parameter values and stress ranges.

	Constant parameters			Variable parameters and stesses			
	Bates	SVJJ		Merton	Bates	SVJJ	Stress range
κ	3.99	3.46	σ_V	0.09	0.27	0.14	[0, 1]
θ	0.014	0.008	σ_S	0.15	0.15	0.0001	[0, 1]
ρ	-0.79	-0.82	μ_S	-0.12	-0.1391	-0.0865	[-2, 2]
$\sqrt{V_0}$	0.094	0.087	λ	12	12	12	[1, 30]
			μ_V			0.05	[0, 2]
			ρ_J			-0.38	[-1, 1]

within the specified stress ranges, 25 times. Every stressed parameter value is used to generate $1\ 000$ sample asset price paths. All other parameters are kept constant at their calibrated values. The performances of the jump detection tests in Section 4.3 are recorded, as per Section 4.4 and the stress ranges divided into categories, such that every jump detection test produces similar absolute and relative performances across the parameter values within each category. Thereafter, five random values are generated per parameter category. Every stressed parameter value is used to generate $1\ 000$ sample asset price paths. For every parameter category, the average performances of each jump detection test, across the five stresses, are recorded and tabulated in Appendices B to D. This is repeated for all the variable parameters, sampling frequencies and data generating processes.

For high values of the volatility-of-volatility parameter, σ_V, the Feller condition associated with the variance process under the Bates model is violated. The literature acknowledges that in practice this condition is often violated when calibrating the Heston and Bates models to observed market data (see Mishra and Lu (2020) and Clark (2011) for example). A correction is applied to the simulated data in this dissertation to ensure that the variance process is always non-negative.

4.3 Jump detection tests

The following jump detection tests are considered as part of the comparative study at a 1% significance level.

- **BNS test:** The multi-power variation test of Barndorff-Nielsen and Shepard (2004, 2006) with test statistic given by Equation (2.8), which utilises Equations (2.9) with $p = 2$ and (2.10) with $p = 4$.

- **ABD test:** The multi-power variation test of Andersen *et al.* (2004) with test statistic given by Equation (2.8), which utilises Equations (2.9) with $p = 2$ and

(2.10) with $p = 3$.

- **MIN test:** The minimum variance test of Andersen *et al.* (2009) with test statistic given by Equation (2.12).

- **MED test:** The median variance test of Andersen *et al.* (2009) with test statistic given by Equation (2.13).

- **CPR test:** The threshold multi-power variation test of Corsi *et al.* (2010) with test statistic given by Equation (2.8), where Equation (2.9) is substituted by Equation (2.14) with $p = 2$ and $\gamma = 1$ and Equation (2.10) is substituted by Equation (2.15) with $p = 3$ and $\gamma = \frac{4}{3}$. Additionally, Equation (2.16) is utilised with $L = 10$ and $c_V = 3$, as well as Equation (2.17) with $c_\vartheta = 3$.

- **DIFF test:** The difference swap variance test of Jiang and Oomen (2008) with test statistic given by Equation (2.19), which utilises Equation (2.22) with $p = 4$.

- **LOG test:** The logarithmic swap variance test of Jiang and Oomen (2008) with test statistic given by Equation (2.20), which utilises Equations (2.9) with $p = 2$ and (2.22) with $p = 4$.

- **RATIO test:** The ratio swap variance test of Jiang and Oomen (2008) with test statistic given by Equation (2.21), which utilises Equations (2.9) with $p = 2$ and (2.22) with $p = 4$.

- **LM test:** The instantaneous volatility test of Lee and Mykland (2008) with test statistic given by Equation (2.23), which utilises Equation (2.24) with $K = \sqrt{252 \times M}$, where M is determined by the sampling frequency.

Jiang *et al.* (2008) experiment with combining the BNS and RATIO tests. A jump is detected by the combination test only if both the BNS and RATIO tests independently identify it. The comparative study in this dissertation considers five such combination tests, the **BNS-RATIO**, **ABD-RATIO**, **MIN-RATIO**, **MED-RATIO** and **CPR-RATIO** tests, which inherit the RATIO test's ability to detect the jump direction. However, these combination tests do not have the ability to implicitly detect the exact timing and size of the jumps like the LM test does.

4.4 Test performance evaluation methodology

Section 3.4 highlights the imbalanced nature of the observed data to which the jump detection tests are applied and the consequences of using performance evaluation metrics sensitive to class imbalances. The data simulated in this dissertation mimics reality in that it has significantly more non-jumps than jumps; a low prevalence. Consequently, the prevalence-insensitive metrics of the MCC and BMI, Equations (3.1) and (3.2), respectively, are used to capture the performances of the jump detection tests.

A jump detection test with both an MCC and BMI value close to 1 has a strong ability to correctly detect jumps and is therefore not comparable to random prediction. Ideally, a jump detection test should produce high values for both these metrics; however, this is not always the case. In order to get a more balanced indication of the jump detection tests' absolute and relative performances, an overall performance metric is calculated by taking the average of the MCC and BMI scores.

For each model, parameter and sampling frequency combination, the jump detection tests are ranked, per parameter category, according to first their MCC performances and then their BMI performances. This is displayed visually in the tabulated results in Appendices B to D by means of heat maps, with the relative MCC performances displayed in green and the relative BMI performances in blue. The darker the shade, the higher the rank of the jump detection test. As the colour fades, the rank of the jump detection test declines.

Chapter 5

Bates model: results and analysis

Across all four sampling frequencies, the volatility-of-volatility, jump volatility, jump mean and jump intensity parameters are stressed, one-at-a-time, under the Bates stochastic volatility jump-diffusion model with dynamics

$$\frac{dS_t}{S_{t-}} = (r - \lambda\mu_J)\,dt + \sqrt{V_t}dW_t^S + J_t dN_t,$$
$$dV_t = \kappa\,(\theta - V_t)\,dt + \sigma_V\sqrt{V_t}dW_t^V,$$

and

$$1 + J_t \sim \mathcal{LN}\left(\mu_S, \sigma_S^2\right),$$

as illustrated in Section 4.1.2. All other parameters are held constant at the values calibrated in Duffie *et al.* (2000), subject to Section 4.2. $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$, where $dW_t^S dW_t^V = \rho dt$ and $\mu_J = \exp\left(\mu_S + \frac{1}{2}\sigma_S^2\right) - 1$.

In this chapter, the effects of stressing the above mentioned parameters under the Bates model on the absolute and relative performances of the jump detection tests are described and analysed.

Similarly, the constant volatility, jump volatility, jump mean and jump intensity parameters are stressed, one-at-a-time, under the Merton constant volatility jump-diffusion model with dynamics

$$\frac{dS_t}{S_{t-}} = (r - \lambda\mu_J)\,dt + \sigma_V dW_t^S + J_t dN_t,$$

and

$$1 + J_t \sim \mathcal{LN}\left(\mu_S, \sigma_S^2\right),$$

as illustrated in Section 4.1.1. All other parameters are held constant at the values calibrated in Tankov and Voltchkova (2009), subject to Section 4.2. $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$, $\mu_S = -0.12$, $\lambda = 12$ and $\mu_J = \exp\left(\mu_S + \frac{1}{2}\sigma_S^2\right) - 1$.

Unless otherwise stated, stressing the parameters under the Merton model yields similar trends to that of the Bates model, with respect to the performances of the jump detection tests. See Appendix D for the tabulated results of the Merton model.

5.1 Volatility-of-volatility parameter: σ_V

See Tables 14 to 17 in Appendix B.
The LM test emerges as the overall optimal jump detection test for parameter values less than 0.33 at the higher sampling frequencies and less than 0.45 at the lower sampling frequencies. However, across all sampling frequencies, as the parameter value increases, the absolute performance of the LM test significantly deteriorates. This is attributed to a decline in its PPV, driven by an increase in the proportion of false positives to the total number of jumps detected. The deterioration is more severe at the higher sampling frequencies, with the LM test's MCC performance ranging from 0.9963 to 0.2860 at the 30-second sampling frequency and 0.9785 to 0.8725 at the 15-minute sampling frequency. Therefore, for parameter values exceeding 0.33, the MCC performance of the LM test generally improves as the sampling frequency decreases. Conversely, across all parameter values, the BMI performance of the LM test declines as the sampling frequency decreases, but generally improves as the parameter value increases. This trend is largely followed by all the other jump detection tests, with the exception of the swap variance tests, whose MCC and BMI performances decline as the parameter value increases. Similarly, the combination tests show a decline in their MCC performances over parameter values ranging from 0 to 0.7 at the higher sampling frequencies and from 0 to 0.45 at the lower sampling frequencies. As the sampling frequency decreases, the improvement in the LM test's MCC performance offsets the decline in its BMI performance, resulting in an improvement in its overall performance for parameter values exceeding 0.45.

For an increase in the volatility-of-volatility parameter, the improvement in the BMI performance of the LM test is less than the improvement in the BMI performances of most of other jump detection tests. The regression in the LM test's relative BMI performances, across all sampling frequencies, is driven by its relatively lower TPRs. This, coupled with its declining MCC performance, drives the deterioration in its overall rank, as seen in Table 4 below. At the higher parameter values, this gives way for either the MED-RATIO test (at the higher sampling frequencies) or the MIN-RATIO test (at the lower sampling frequencies) to outrank the LM test. These tests prove to be less sensitive to the parameter value than the LM test, which is extremely sensitive to the volatility-of-volatility parameter, as seen in Table 4.

Table 4 Overall jump detection test performances when σ_V is stressed under the Bates model.

	σ_V					
	[0, 0.33)	**[0.33, 0.45)**	**[0.45, 0.6)**	**[0.6, 0.7)**	**[0.7, 0.8)**	**[0.8, 1]**
30-second						
LM	0.9951 (1)	0.9679 (6)	0.8507 (11)	0.7325 (11)	0.6795 (11)	0.6401 (11)
MED-RATIO	0.9914 (2)	0.9890 (1)	0.9871 (1)	0.9865 (1)	0.9869 (1)	0.9869 (1)
1-minute						
LM	0.9924 (1)	0.9741 (6)	0.8913 (11)	0.7908 (11)	0.7378 (11)	0.6924 (11)
MED-RATIO	0.9888 (2)	0.9859 (1)	0.9840 (1)	0.9835 (1)	0.9836 (1)	0.9842 (1)
5-minute						
LM	0.9838 (1)	0.9761 (1)	0.9511 (7)	0.9125 (11)	0.8828 (11)	0.8496 (11)
MIN-RATIO	0.9757 (2)	0.9733 (2)	0.9732 (1)	0.9750 (1)	0.9764 (1)	0.9779 (1)
15-minute						
LM	0.9708 (1)	0.9684 (1)	0.9600 (2)	0.9483 (7)	0.9368 (8)	0.9213 (11)
MIN-RATIO	0.9567 (2)	0.9595 (2)	0.9609 (1)	0.9638 (1)	0.9660 (1)	0.9677 (1)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 14 to 17 in Appendix B for the full results.

With an exception of a few scenarios, across all sampling frequencies and parameter categories, all tests experience improved BMI performances relative to their MCC performances. The driving factor behind this is their PPVs deviating the most from 1 when compared to their TPR, TNR and NPV scores.

Across all sampling frequencies and parameter categories, the swap variance tests emerge as the worst performing jump detection tests. Their poor performances are driven by low PPVs and TNRs, which deteriorate further at the higher parameter values. An exception to this is at the 30-second sampling frequency, for parameter values exceeding 0.8, where the MCC performance of the LM test is ranked even below that of the swap variance tests, due to its particularity low PPV of 0.0927.

When the volatility parameter under the Merton model is stressed, the absolute performance of the LM test is remarkably less sensitive to changes in the parameter value than under the Bates model. As a result the LM test remains the optimal jump detection test even at high volatilities. See Tables 54 to 57 in Appendix D.

5.2 Jump volatility parameter: σ_S

See Tables 18 to 21 in Appendix B.
The LM test emerges as the overall optimal jump detection test across all sampling frequencies. An exception to this is for jump volatilities ranging from 0.4 to 0.66

at the 30-second and 1-minute sampling frequencies, where the performance of the MED-RATIO test marginally outranks that of the LM test. Nonetheless, the outperformance is miniscule. As the jump volatility increases, there is an improvement in the performance of the LM test. The total change in both the MCC and BMI performances of the LM test, across the parameter categories, is less than 1%, but does increase as the sampling frequency decreases. This implies that the LM test is relatively insensitive to changes in the jump volatility parameter. The drivers behind the small change in the LM test's performance are its TPR and PPV. As the sampling frequency decreases, the absolute performance of the LM test declines. This is attributed to a decline in its TPR across the sampling frequencies. This is common amongst all the tests.

The LM test produces the highest PPVs; therefore, its MCC performance outranks that of all other jump detection tests. However, this is not always true for its BMI performance. In fact, with the exception of jump volatilities ranging from 0 to 0.4 and 0.8 to 1, the combination tests produce improved BMI performances relative to the LM test. This is driven by the LM test producing slightly lower TPRs. Nonetheless, the difference in the BMI performances of the combination tests relative to the LM test is less than 1%. Therefore, the LM test's BMI performance is still comparable to that of the optimal tests. This, coupled with its MCC outperformance, makes the LM test the overall optimal choice.

Across all sampling frequencies and parameter categories, all tests experience improved BMI performances relative to their MCC performances, due to their PPVs, which notably deviate from 1. An exception to this is at the lower sampling frequencies, where the LM test experiences relatively higher MCC performances. This is attributed to the LM test producing TNRs, PPVs and NPVs of either 1 or close thereto, but TPRs that deviate from 1.

The swap variance tests emerge as the worst performing jump detection tests. This is attributed to their relatively low TNRs and PPVs. An exception to this is at the 30-second sampling frequency, for jump volatilities ranging from 0.4 to 0.66, where the CPR test ranks the lowest, due to its relatively lower PPV. Therefore, over this range, the CPR test is the most spurious jump detection test. By contrast, over this range, the swap variance tests are slightly less spurious, but still notably underperform all the other tests. Unlike with the LM test, the performances of the swap variance tests notably decline as the jump volatility parameter increases. The swap variance tests emerge as the most sensitive to changes in the jump volatility parameter, particularly at the higher sampling frequencies. This is attributed to the significant volatility experienced by their TNRs and PPVs. The combination tests experience more volatility over the parameter categories than their non-swap variance test constituents. This is driven by the significant volatility that the RATIO test experiences.

5.3 Jump mean parameter: μ_S

See Tables 22 to 25 in Appendix B.

Across all sampling frequencies, the LM test is notably insensitive to changes in the jump mean parameter, as indicated in Table 5 below. However, as the parameter value changes, the overall rank of the LM test changes quite significantly, due to the volatility in the performances of the other jump detection tests. The volatility is driven by the sensitivity to changes in the jump mean parameter of their PPVs and TNRs, as well as their TPRs at the 15-minute sampling frequency. Table 5 clearly indicates that at the 30-second sampling frequency, the LM test is ranked first for parameter values ranging from 0.9 to 1.8 and eleventh for parameter values between 1.8 and 2, yet there is no change in the absolute value of its performance.

At the higher sampling frequencies, the LM test emerges as the overall optimal jump detection test for parameter values ranging from -2 to 1.8. The MED-RATIO test emerges as the second optimal test, but its performance is notably poorer, on average 1.31% less, than that of the LM test. This is largely attributed to its lower PPVs and TNRs. However, for parameter values ranging from 1.8 to 2, the combination tests, together with their non-swap variance test constituents, outperform the LM test. This is attributed to a relative decline in the LM test's TPRs, coupled with an increase in the PPVs and TNRs of the other non-swap variance tests, which the LM test does not experience. While the absolute performance of the LM is stable, the other jump detection tests, excluding the swap variance tests, become more accurate at detecting jumps when the parameter value increases and sampling frequency decreases. Eventually, the other tests outperform the LM test, with MCC and BMI performances of either 1 or close thereto.

Table 5 Overall performances of the LM jump detection test when μ_S is stressed under the Bates model.

	μ_S						
	[-2, -0.75)	**[-0.75, -0.3)**	**[-0.3, 0.25)**	**[0.25, 0.9)**	**[0.9, 1.3)**	**[1.3, 1.8)**	**[1.8, 2]**
30-second	0.9983 (1)	0.9982 (1)	0.9946 (1)	0.9980 (1)	0.9988 (1)	0.9988 (1)	0.9988 (11)
1-minute	0.9973 (1)	0.9970 (1)	0.9924 (1)	0.9967 (1)	0.9977 (1)	0.9978 (9)	0.9978 (11)
5-minute	0.9950 (1)	0.9944 (1)	0.9839 (1)	0.9936 (1)	0.9953 (11)	0.9953 (11)	0.9953 (11)
15-minute	0.9911 (3)	0.9906 (1)	0.9726 (1)	0.9885 (1)	0.9912 (11)	0.9912 (14)	0.9912 (14)

Overall performances calculated by taking the average of the MCC and BMI performances. The rank of the LM test is presented (in parenthesis).
This is a partial table. See Tables 22 to 25 in Appendix B for the full results.

Overall, the swap variance tests emerge as the worst performing jump detection tests across all sampling frequencies. They significantly underperform at the higher sampling frequencies. For parameter values exceeding 1.3, these tests do not produce MCC values. This is attributed to the tests incorrectly identifying all days as having a jump. Additionally, over this range, their BMI performances are particularly poor with values of zero, due to their TNRs producing zero values. While the swap variance tests are exceptionally spurious at the higher sampling frequencies, they are very accurate at the 15-minute sampling frequency, for parameter values ranging from 1.8 to 2; producing both perfect MCC and BMI performances. Therefore, the swap variance tests are very sensitive to both changes in the sampling frequencies and changes in the jump mean parameter. This is particularly true for the DIFF test at the 5-minute sampling frequency, where its overall performance ranges from 0.2372 to 0.9691. This overall improvement in the DIFF test's performance, which is not experienced by the other swap variance tests, is driven by its PPVs and TNRs.

At the 15-minute sampling frequency, for parameter values ranging from 1.3 to 2, the improved performances of all the other tests results in the LM test ranking as the worst performing jump detection test. However, over the ranges where the swap variance tests rank last, their performances are significantly lower than that of the other tests. When the LM test ranks last, its overall absolute performance is still comparable to that of the other tests.

At the 5-minute sampling frequency, the LM test undergoes a similar experience to that at the higher sampling frequencies, but with the MIN-RATIO test emerging as the next comparable jump detection test. However, for parameter values ranging from 1.8 to 2, the CPR-RATIO and CPR tests outrank the MIN-RATIO test.

All tests experience a significant drop in their performances, felt across all metrics, when the mean of the price jumps is close to zero. Since the LM test is less sensitive to changes in the jump mean parameter, it experiences a relatively lower regression in its absolute performance. Hence, at the 15-minute sampling frequency, the LM test emerges as the overall optimal jump detection test for parameter values ranging from -0.75 to 0.9, as indicated in Table 5. This is the only range over which the LM test outperforms at the 15-minute sampling frequency.

For parameter values ranging from 0.9 to 2, across all sampling frequencies, the performance of each combination test is matched by the performance of its non-swap variance test constituent.

5.4 Jump intensity parameter: λ

See Tables 26 to 29 in Appendix B.
Across all sampling frequencies, the LM test emerges as the overall optimal jump detection test. An exception is at the 30-second sampling frequency for parameter values ranging from 1 to 1.8, where the MED-RATIO test's overall performance outranks that of the LM test, attributed to its marginally higher PPV. The LM test's performance declines as the sampling frequency decreases. Generally, this is the case for all the other tests.

As the parameter value changes, the LM test experiences more volatility in its MCC performance compared to its BMI performance. This is attributed to the sensitivity of its PPV to changes in the jump intensity parameter. This is expected as the jump intensity parameter determines the prevalence in the data, which the PPV is sensitive to. All jump detection tests experience improved BMI performances relative to their MCC performances, due to their PPVs notably deviating from 1. However, the LM test produces an improved MCC performance for parameter values ranging from 5.1 to 30. Over this range, the LM test's PPVs are close to 1, while its TPRs deviate from 1. The non-combination tests, excluding the LM test, experience a notable contrast between their MCC and BMI performances. This is due to their exceptionally low PPVs, which hinder their MCC performances, particularly at the lower parameter values. These tests are also more sensitive to changes in the jump intensity parameter than the LM and combination tests, due to the sensitivity of their PPVs, which on average, change by 0.43 across the parameter categories.

Generally, across the parameter categories, when the tests experience increasing MCC performances, their BMI performances are declining. When the parameter value increases, so too do the PPVs, while the TNRs decline, resulting in the above. This indicates that, as the jump intensity increases, there is a reduction in the number of false positives, implying that the tests become less spurious.

The absolute BMI performances of the combination tests are comparable to that of the LM test, particularly the MED-RATIO test at the higher sampling frequencies and the MIN-RATIO test at the lower sampling frequencies. At the lower sampling frequencies, the combination tests experience marginally improved BMI performances relative to the LM test, driven by their TPRs.

Across all sampling frequencies and parameter categories, the swap variance tests emerge as the worst performing jump detection tests, together with the CPR test. However, at high jump intensities, while the CPR test ranks relatively low, it experiences a significant absolute improvement in its MCC, due to a notable increase in its PPV of approximately 0.65.

Chapter 6

SVJJ model: results and analysis

Across all four sampling frequencies, the volatility-of-volatility, price jump volatility, price jump mean, jump intensity, volatility jump rate and jump correlation parameters are stressed, one-at-a-time, under the double jump stochastic volatility jump-diffusion model with dynamics

$$\frac{dS_t}{S_{t-}} = (r - \lambda\mu_J)\,dt + \sqrt{V_{t-}}dW_t^S + J_t dN_t,$$
$$dV_t = \kappa\,(\theta - V_{t-})\,dt + \sigma_V\sqrt{V_{t-}}dW_t^V + Z_t dN_t,$$

and

$$Z_t \sim \text{Exp}\,(\mu_V)\,,$$
$$1 + J_t \mid Z_t \sim \mathcal{LN}\left(\mu_S + \rho_J Z_t, \sigma_S^2\right),$$

as illustrated in Section 4.1.3. All other parameters are held constant at the values calibrated in Duffie *et al.* (2000), subject to Section 4.2. $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$, where $dW_t^S dW_t^V = \rho dt$ and $\mu_J = \dfrac{\exp\left(\mu_S + \frac{1}{2}\sigma_S^2\right)}{1 - \rho_J\mu_V} - 1$.

In this chapter, the effects of stressing the above mentioned parameters under the SVJJ model on the absolute and relative performances of the jump detection tests are described and analysed.

6.1 Volatility-of-volatility parameter: σ_V

See Tables 30 to 33 in Appendix C.

At the higher sampling frequencies, the MED-RATIO test emerges as the overall optimal jump detection test. At the 5-minute sampling frequency, the MIN-RATIO test emerges as the overall optimal jump detection test. At the 15-minute sampling frequency, the LM test emerges as the overall optimal choice for parameter values less than 0.87, while for values exceeding 0.87, the BNS-RATIO test marginally outperforms the LM test; thus, emerging as the optimal choice, as highlighted in Table 6 below. This is driven by the BNS-RATIO test experiencing slightly higher TPRs and PPVs than the LM test.

Table 6 Overall jump detection test performances when σ_V is stressed under the SVJJ model.

	σ_V				
	[0, 0.34)	**[0.34, 0.5)**	**[0.5, 0.67)**	**[0.67, 0.87)**	**[0.87, 1]**
30-second					
LM	0.9942 (6)	0.9749 (6)	0.9149 (11)	0.8393 (11)	0.7555 (14)
MED-RATIO	0.9978 (1)	0.9973 (1)	0.9967 (1)	0.9963 (1)	0.9960 (1)
1-minute					
LM	0.9946 (5)	0.9827 (6)	0.9418 (10)	0.8839 (11)	0.8118 (11)
MED-RATIO	0.9972 (1)	0.9966 (1)	0.9961 (1)	0.9957 (1)	0.9950 (1)
5-minute					
LM	0.9919 (2)	0.9877 (3)	0.9761 (6)	0.9557 (7)	0.9232 (11)
MIN-RATIO	0.9928 (1)	0.9915 (1)	0.9893 (1)	0.9877 (1)	0.9850 (1)
15-minute					
LM	0.9883 (1)	0.9858 (1)	0.9804 (1)	0.9730 (1)	0.9602 (5)
BNS-RATIO	0.9670 (4)	0.9666 (4)	0.9671 (3)	0.9674 (3)	0.9676 (1)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 30 to 33 in Appendix C for the full results.

Table 6 highlights that the top performing tests all experience a decline in their absolute performances as the volatility-of-volatility parameter increases. Similarly, Table 6 highlights that the absolute and relative performances of the LM test deteriorate as the volatility-of-volatility parameter increases. This is driven by its MCC performance, in particular, a decline in its PPV on both an absolute and relative basis. While this is true for all the jump detection tests, it is more prominent in the LM and swap variance tests. At the 15-minute sampling frequency, for parameter values less than 0.87, the LM test's PPVs are higher than those of the other jump detection tests, resulting in its outperformance. At the lower sampling frequencies, the LM test's ability to correctly detect jumps improves relative to the other tests.

Generally, for all the tests, the MCC performances are more sensitive to changes in the volatility-of-volatility parameter than the BMI performances. This is driven by the PPV, which experiences much volatility across the various parameter categories. The BMI performances of the swap variance tests show slightly more sensitivity to changes in the parameter value than the other jump detection tests. This is driven by their TNRs, which experience a definite decrease as the volatility-of-volatility parameter increases. Overall, the MCC performance of the LM test is the most sensitive to changes in the volatility-of-volatility parameter, particularly at the higher sampling frequencies. The LM test's MCC performances range from 0.9952 to 0.5140 at the 30-second sampling frequency and from 0.9902 to 0.9330 at the 15-minute sampling frequency. This drives the sensitivity in the overall performance of the LM test, which results in it emerging as the overall most sensitive test. Table 6 highlights the sensitivity in its relative performance.

Overall, the MED-RATIO and MIN-RATIO tests consistently rank high (within the top three tests). However, at the 15-minute sampling frequency, for parameter values exceeding 0.5, the MIN-RATIO test's relative performance declines, such that its overall rank drops to sixth. This is driven by a relative decrease in its TPR.

Across all sampling frequencies and parameter categories, all tests experience improved BMI performances relative to their MCC performances. This is primarily attributed to the tests experiencing TPRs and TNRs of either 1 or close thereto, but PPVs that deviate significantly from 1.

Across all sampling frequencies, the swap variance tests emerge as the worst performing jump detection tests. Their poor performances are driven by low PPVs and TNRs, which deteriorate further at the higher parameter values. An exception to this is at the 30-second sampling frequency, for parameter values exceeding 0.87, where the MCC and overall performance of the LM test ranks even below that of the swap variance tests, due to its particularity low PPV of 0.3228.

6.2 Price jump volatility parameter: σ_S

See Tables 34 to 37 in Appendix C.

Table 7 below highlights that at the 30-second and 1-minute sampling frequencies, the LM test emerges as the overall optimal jump detection test for price jump volatilities exceeding 0.03. The MED-RATIO test marginally outranks the LM test for volatilities less than 0.03. This is attributed to the MED-RATIO test's higher TPRs. Thereafter, the performance of the MED-RATIO test deteriorates and deviates from that of the LM test, resulting in the two becoming less comparable. This deviation in performance is driven by large differences in the TPR, TNR and NPV of the two tests. At the 5-minute sampling frequency, the LM test emerges as the overall optimal test for price jump volatilities exceeding 0.03. The MIN-RATIO test marginally outranks the LM test for volatilities less than 0.03. The same observations as with the MED-RATIO test are observed for the MIN-RATIO test. At the 15-minute sampling frequency, the LM test ranks as the overall optimal jump detection test across all parameter categories.

Table 7 Overall jump detection test performances when σ_S is stressed under the SVJJ model.

	σ_S					
	[0, 0.03)	**[0.03, 0.39)**	**[0.39, 0.4)**	**[0.4, 0.5)**	**[0.5, 0.8)**	**[0.8, 1]**
30-second						
LM	0.9961 (5)	0.9852 (1)	0.9890 (1)	0.9900 (1)	0.9923 (1)	0.9935 (1)
MED-RATIO	0.9979 (1)	0.9810 (3)	0.9875 (5)	0.9892 (2)	0.9914 (2)	0.9912 (2)
1-minute						
LM	0.9957 (5)	0.9809 (1)	0.9863 (1)	0.9874 (1)	0.9901 (1)	0.9921 (1)
MED-RATIO	0.9973 (1)	0.9763 (2)	0.9842 (2)	0.9863 (2)	0.9893 (2)	0.9886 (2)
5-minute						
LM	0.9925 (2)	0.9631 (1)	0.9744 (1)	0.9761 (1)	0.9814 (1)	0.9844 (1)
MIN-RATIO	0.9931 (1)	0.9498 (3)	0.9666 (3)	0.9689 (3)	0.9764 (2)	0.9780 (2)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 34 to 37 in Appendix C for the full results.

At the higher sampling frequencies and low price jump volatilities, the LM test's overall rank drops to fifth, as highlighted in Table 7. This is attributed to the combination tests' improved overall performances relative to the LM test over this range, making the LM and combination tests comparable on an absolute basis. However, as the price jump volatility increases and the sampling frequency decreases, there is a deviation in the performances of the LM test and combination tests, with the combination tests' overall performances regressing relative to that of the LM test. The deviation is driven by a deterioration in the TNRs, PPVs and NPVs of the combination tests relative to the LM test. This is due to the RATIO test as the swap variance tests emerge as the worst performing jump detection tests across all sampling frequencies and parameter categories. Notably, their performances significantly deviate from the other jump detection tests at the higher price jump volatility levels, due to their particularly low PPVs. At the 1-minute sampling frequency, for parameter values ranging from 0.39 to 0.5, the CPR test emerges as the worst performing test, due to it experiencing lower TPRs and NPVs than the swap variance tests.

The LM test experiences a decline in performance for parameter values less than 0.39 and exceeding 0.8, but an improvement in performance for parameter values between 0.39 and 0.8. This is true for all tests, with the exception of the swap variance tests, which only experience an improvement in performance over the range 0.39 to 0.5.

The non-combination tests, excluding the LM test, experience improved BMI performances relative to their MCC performances, predominately driven by their low PPVs. Conversely, the LM test experiences improved MCC performances, due to its low TPRs, while the combination tests show no clear trend in this regard.

There is a slight decline in the overall performance of the LM test as the sampling frequency decreases. This is true for all jump detection tests. However, the LM test experiences a smaller change when compared to the other tests. Similarly, the LM test experiences relatively less changes in its performance across the parameter categories. Therefore, the LM test is the least sensitive to changes in the price jump volatility parameter, while the swap variance tests are the most sensitive.

6.3 Price jump mean parameter: μ_S

See Tables 38 to 41 in Appendix C.
The LM test emerges as the overall optimal jump detection test at the higher sampling frequencies and for parameter values ranging from -2 to 1.55 at the 5-minute sampling frequency and from -2 to 1.2 at the 15-minute sampling frequency. At the lower sampling frequencies, the LM test experiences a deterioration in its ranking for particularly high parameter values. This is more notable at the 15-minute sampling frequency. Despite it experiencing a stable absolute performance over this range, the volatility in the performances of the other tests results in the change in the LM test's overall rank, as indicated in Table 8 below. The volatility is driven by the sensitivity of the other tests' TPRs to changes in the price jump mean parameter.

As the sampling frequency decreases, so too does the performances of all the tests. All tests experience a significant drop in their performances, felt across all metrics, when the mean of the price jumps is close to zero, particularly at the lower sampling frequencies. Since the LM test is less sensitive to changes in the jump mean parameter, it experiences a relatively lower regression in its absolute performance. The combination tests prove to be particularly sensitive to the parameter value when it ranges from 0 to 0.08, which is demonstrated by the notable changes in their overall ranks over this range. This is highlighted in Table 8 for the MED-RATIO and MIN-RATIO tests.

Conversely, at the 30-second, 1-minute and 5-minute sampling frequencies, the swap variance tests experience an improvement in their performances for parameter values ranging from 0 to 0.68. This is attributed to an improvement in their TNRs and PPVs over this range. These tests perform particularly poorly, both absolutely and relatively, when the mean of the price jumps is high. Resultantly, they emerge as the worst performing jump detection tests over the higher parameter categories as well as for parameter values ranging from -2 to 0. Their poor performances are predominately driven by their PPVs. At the 15-minute sampling frequency, for high parameter values, the swap variance tests experience a notable improvement in their BMI performances, driven by both their TPRs and TNRs increasing. Their MCC performances do not experience this, due to their notably low PPVs.

The MIN test emerges as the worst performing jump detection test for parameter values ranging from 0 to 0.08 at the lower sampling frequencies and from 0 to 0.04 at the higher sampling frequencies, with the CPR test ranking lower for price jump means ranging from 0.04 to 0.08. This is largely attributed to their TPRs and PPVs significantly declining over this range, with their TNRs and NPVs also experiencing a drop in performance. This is experienced by the non-combination tests, excluding the LM test, which all experience their lowest rankings over this range. This contributes to the inconsistency in the MED-RATIO and especially the MIN-RATIO tests' performances. Their overall absolute and relative performances dramatically decline over this range, as indicated in Table 8. Moreover, over this range, the performances of these tests are not comparable to that of the LM test and in fact become more comparable to that of the swap variance tests at the lower sampling frequencies. Nevertheless, for all other ranges, the MED-RATIO test ranks second overall at the higher sampling frequencies with the MIN-RATIO test ranking second at the lower sampling frequencies.

Table 8 Overall jump detection test performances when μ_S is stressed under the SVJJ model.

	μ_S								
	[-2, 0)	[0, 0.017)	[0.017, 0.03)	[0.03, 0.04)	[0.04, 0.08)	[0.08, 0.68)	[0.68, 1.2)	[1.2, 1.55)	[1.55, 2]
30-second									
LM	0.9975 (1)	0.7871 (1)	0.8701 (1)	0.9187 (1)	0.9577 (1)	0.9951 (1)	0.9974 (1)	0.9976 (1)	0.9977 (1)
MED-RATIO	0.9889 (2)	0.6892 (8)	0.7856 (5)	0.8784 (5)	0.9458 (5)	0.9948 (2)	0.9821 (2)	0.9746 (2)	0.9801 (2)
1-minute									
LM	0.9971 (1)	0.7269 (1)	0.8256 (1)	0.8969 (1)	0.9495 (1)	0.9947 (1)	0.9970 (1)	0.9973 (1)	0.9974 (1)
MED-RATIO	0.9894 (2)	0.6370 (4)	0.7305 (6)	0.8465 (4)	0.9317 (3)	0.9934 (2)	0.9814 (2)	0.9757 (2)	0.9835 (2)
5-minute									
LM	0.9938 (1)	0.5541 (1)	0.6256 (1)	0.7853 (1)	0.9048 (1)	0.9914 (1)	0.9942 (1)	0.9944 (1)	0.9944 (3)
MIN-RATIO	0.9840 (2)	0.4353 (10)	0.4548 (11)	0.6420 (11)	0.8374 (6)	0.9874 (2)	0.9809 (2)	0.9860 (2)	0.9956 (1)
15-minute									
LM	0.9901 (1)	0.4252 (1)	0.4227 (1)	0.6044 (1)	0.8192 (1)	0.9862 (1)	0.9904 (1)	0.9906 (3)	0.9906 (11)
MIN-RATIO	0.9797 (2)	0.2527 (13)	0.2435 (13)	0.3730 (13)	0.6255 (12)	0.9669 (2)	0.9836 (2)	0.9933 (1)	0.9978 (1)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 38 to 41 in Appendix C for the full results.

6.4 Jump intensity parameter: λ

See Tables 42 to 45 in Appendix C.

At the higher sampling frequencies, the MED-RATIO test emerges as the overall optimal jump detection test, outperforming the LM test, as indicated in Table 9 below. At the 1-minute sampling frequency, for jump intensities ranging from 16 to 21.5, the MIN-RATIO test marginally outperforms the MED-RATIO test; however, this outperformance is miniscule on an absolute basis. The MIN-RATIO test outperforms for jump intensities ranging from 11 to 30 at the 5-minute sampling frequency; otherwise, the LM test emerges as the overall optimal jump detection test at the lower sampling frequencies.

Table 9 Overall jump detection test performances when λ is stressed under the SVJJ model.

	λ				
	[1, 3)	**[3, 11)**	**[11, 16)**	**[16, 21.5)**	**[21.5, 30]**
30-second					
LM	0.9904 (3)	0.9938 (5)	0.9966 (5)	0.9972 (5)	0.9976 (5)
MED-RATIO	0.9943 (1)	0.9968 (1)	0.9984 (1)	0.9986 (1)	0.9987 (1)
1-minute					
LM	0.9897 (2)	0.9935 (3)	0.9958 (5)	0.9965 (5)	0.9969 (5)
MED-RATIO	0.9910 (1)	0.9952 (1)	0.9975 (1)	0.9976 (2)	0.9979 (1)
5-minute					
LM	0.9860 (1)	0.9903 (1)	0.9928 (2)	0.9935 (2)	0.9939 (2)
MIN-RATIO	0.9719 (2)	0.9852 (2)	0.9930 (1)	0.9943 (1)	0.9950 (1)
15-minute					
LM	0.9812 (1)	0.9854 (1)	0.9890 (1)	0.9894 (1)	0.9899 (1)
MIN-RATIO	0.9308 (2)	0.9581 (2)	0.9724 (3)	0.9718 (6)	0.9659 (6)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 42 to 45 in Appendix C for the full results.

The LM test experiences declining TPRs relative to its PPVs for a simultaneous increase in the parameter value and decrease in the sampling frequency, resulting in an improvement in its MCC performances relative to its BMI performances. Generally, as the parameter value increases, all tests experience improved MCC performances and weakened BMI performances, due to increasing PPVs and decreasing TPRs and TNRs. An exception to this is the MED-RATIO test, which experiences improved BMI performances at the 1-minute sampling frequency and for parameter values ranging from 16 to 30 at the lower sampling frequencies. This is attributed to the increase in its PPV over these ranges. All jump detection tests experience more volatility in their MCC performances relative to their BMI performances. This is attributed to the sensitivity of their PPVs to changes in the jump intensity parameter compared to their TPRs and TNRs, which are relatively insensitive. Resultantly, the overall performances of the jump detection tests improve as the parameter value increases, primarily driven by the notable increase in the PPVs.

The MIN-RATIO test performs relatively well at the 5-minute sampling frequency, but experiences a decrease in its rank at the 15-minute sampling frequency, particularly for high parameter values, as highlighted in Table 9. This is attributed to the other tests experiencing relatively greater improvements in their overall performances over this range.

The LM test experiences a TNR of 1 over all sampling frequencies and parameter categories, while the other tests do not. However, the LM test produces relatively lower TPRs, compared to the other jump detection tests, resulting in its BMI performance ranking, on average, sixth. An exception to this is at the 15-minute sampling frequency, for parameter values between 21.5 and 30, where the TPRs of the other tests fall below that of the LM test. At the higher sampling frequencies, the overall rank of the LM test decreases as the parameter value increases. This is driven by its BMI performance relative to that of the other tests, particularly due to its lower TPRs.

All the jump detection tests experience declining performances as the sampling frequency decreases. However, this is relatively less severe for the LM test, resulting in its overall rank increasing as the sampling frequency decreases. This is attributed to it experiencing higher MCC performances, driven by its relatively higher PPVs, which offset the decline in performance of its TPRs. Therefore, as the sampling frequency decreases, the LM test becomes relatively less spurious.

Across all sampling frequencies and parameter categories, the swap variance tests emerge as the worst performing jump detection tests, together with the CPR test. This is driven by their relatively low PPVs and TNRs, which is especially noticeable when the parameter value is low.

6.5 Volatility jump rate parameter: μ_V

See Tables 46 to 49 in Appendix C.

At the higher sampling frequencies, the MED-RATIO test emerges as the overall optimal jump detection test. Table 10 below indicates that the outperformance, relative to the LM test, is more notable at the higher parameter values. The LM test experiences a decline in both its overall absolute and relative performances as the parameter value increases. This is due to its PPV being more sensitive to the parameter value than the PPVs of the combination tests, which outrank the LM test. Therefore, at the higher sampling frequencies, the LM test is more sensitive to changes in the volatility jump rate parameter than the combination tests.

At the lower sampling frequencies, the combination tests become more sensitive to changes in the parameter value, resulting in a decline in their overall ranks. This is shown in Table 10 with regards to the MIN-RATIO test. This is driven by the combination tests' TPRs becoming more sensitive to the parameter value as the sampling frequency decreases. At the 5-minute sampling frequency, the MIN-RATIO test outperforms the LM test for parameter values ranging from 0.05 to 0.37, due to its relatively higher TPRs. Across all other parameter categories, the LM test emerges as the overall optimal jump detection test at the lower sampling frequencies.

Table 10 Overall jump detection test performances when μ_V is stressed under the SVJJ model.

	μ_V			
	[0, 0.05)	**[0.05, 0.18)**	**[0.18, 0.37)**	**[0.37, 2]**
30-second				
LM	0.9971 (3)	0.9945 (6)	0.9907 (6)	0.9878 (6)
MED-RATIO	0.9976 (1)	0.9980 (1)	0.9976 (1)	0.9966 (1)
1-minute				
LM	0.9967 (3)	0.9947 (5)	0.9921 (6)	0.9895 (6)
MED-RATIO	0.9968 (1)	0.9973 (1)	0.9971 (1)	0.9962 (1)
5-minute				
LM	0.9934 (1)	0.9916 (2)	0.9894 (2)	0.9844 (1)
MIN-RATIO	0.9926 (2)	0.9927 (1)	0.9905 (1)	0.9756 (3)
15-minute				
LM	0.9895 (1)	0.9875 (1)	0.9805 (1)	0.9551 (1)
MIN-RATIO	0.9795 (2)	0.9621 (6)	0.9189 (7)	0.8785 (7)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 46 to 49 in Appendix C for the full results.

As the sampling frequency decreases, each test experiences a decline in its performance, predominately driven by declining PPVs and TNRs. Similarly, there is a decline in the PPVs and TNRs as the parameter value increases, resulting in the tests experiencing a deterioration in their performances over the parameter categories. At the higher sampling frequencies, all tests experience MCC performances that are more sensitive to changes in the parameter value than their BMI performances. However, at the lower sampling frequencies the opposite holds true. This is attributed to the TPR being notably more sensitive to changes in the parameter value at the lower sampling frequencies, while the PPV is more sensitive to changes in the parameter value at the higher sampling frequencies.

All tests experience improved BMI performances relative to their MCC performances. This is attributed to the PPVs deviating from 1. However, at the 15-minute sampling frequency, the LM and MIN-RATIO tests experience TPRs that deviate further from 1 than their PPVs, resulting in improved MCC performances.

Across all sampling frequencies, the swap variance tests emerge as the worst performing jump detection tests. This is driven by their relatively low PPVs and TNRs. At the lower sampling frequencies, the MIN test emerges as the most sensitive to changes in the parameter value, due to its TPR. It experiences a notable decline in both its absolute and relative BMI performances as the parameter value increases; hence, it experiences the worst BMI performance for parameter values ranging from 0.18 to 2 at the 15-minute sampling frequency. This too contributes to the decreasing overall rank of the MIN-RATIO test over these ranges.

6.6 Jump correlation parameter: ρ_J

See Tables 50 to 53 in Appendix C.
At the higher sampling frequencies, the MED-RATIO test emerges as the optimal jump detection test for parameter values ranging from -1 to 0.4. For correlations exceeding 0.4, it experiences a notable decline in its overall absolute performance, resulting in a decrease in its overall rank to fifth, as highlighted in Table 11 below. The MIN-RATIO test emerges as the second optimal test, but it too experiences a sharp decrease in its rank across the parameter categories, attributed to its TPRs declining relative to the other tests. Similarly, this trend is seen at the lower sampling frequencies. This suggests that while the MED-RATIO and MIN-RATIO tests are optimal choices when there are negative correlations between the price and volatility jumps, they become relatively spurious when there are strong positive correlations.

Conversely, the rank of the LM test increases as the correlation between the price and volatility jumps becomes more strongly positive. The LM test emerges as the optimal jump detection test for correlations exceeding 0.75 and 0.4 at the 30-second and 1-minute sampling frequencies, respectively. At the lower sampling frequencies, the LM test outperforms, except for parameter values ranging between -0.95 and 0.07 at the 5-minute sampling frequency, where the MIN-RATIO test marginally outperforms. Nonetheless, the outperformance is miniscule on an ab-

Table 11 Overall jump detection test performances when ρ_J is stressed under the SVJJ model.

	ρ_J					
	[-1, -0.95)	**[-0.95, 0.07)**	**[0.07, 0.3)**	**[0.3, 0.4)**	**[0.4, 0.75)**	**[0.75, 1]**
30-second						
LM	0.9966 (5)	0.9960 (5)	0.9933 (6)	0.9869 (6)	0.9778 (5)	0.9667 (1)
MED-RATIO	0.9977 (1)	0.9979 (1)	0.9980 (1)	0.9927 (1)	0.9786 (2)	0.9580 (5)
MIN-RATIO	0.9974 (2)	0.9976 (2)	0.9976 (2)	0.9913 (5)	0.9757 (6)	0.9526 (6)
1-minute						
LM	0.9964 (3)	0.9957 (5)	0.9930 (6)	0.9872 (6)	0.9758 (1)	0.9602 (1)
MED-RATIO	0.9971 (1)	0.9972 (1)	0.9972 (1)	0.9903 (1)	0.9733 (3)	0.9480 (3)
MIN-RATIO	0.9970 (2)	0.9972 (2)	0.9970 (2)	0.9889 (5)	0.9695 (6)	0.9413 (6)
5-minute						
LM	0.9930 (1)	0.9925 (2)	0.9905 (2)	0.9813 (1)	0.9599 (1)	0.9276 (1)
MED-RATIO	0.9903 (3)	0.9904 (3)	0.9897 (3)	0.9749 (2)	0.9443 (2)	0.9023 (3)
MIN-RATIO	0.9930 (2)	0.9932 (1)	0.9919 (1)	0.9733 (3)	0.9379 (6)	0.8892 (6)
15-minute						
LM	0.9892 (1)	0.9887 (1)	0.9858 (1)	0.9678 (1)	0.9330 (1)	0.8822 (1)
MED-RATIO	0.9733 (3)	0.9734 (2)	0.9658 (2)	0.9324 (2)	0.8852 (2)	0.8219 (2)
MIN-RATIO	0.9751 (2)	0.9720 (3)	0.9500 (6)	0.9020 (7)	0.8472 (7)	0.7757 (7)

Overall performances calculated by taking the average of the MCC and BMI performances. The ranks of the jump detection tests are presented (in parenthesis).
This is a partial table. See Tables 50 to 53 in Appendix C for the full results.

solute basis, as indicated in Table 11.

Generally, for a simultaneous increase in the parameter value and decrease in the sampling frequency, all tests experience a decline in their overall performances. This is driven by a decrease in their MCC performances, predominately due to declining PPVs and a decrease in their BMI performances, due to declining TPRs.

Table 11 highlights that the LM, MED-RATIO and MIN-RATIO tests are relatively sensitive to changes in the jump correlation parameter. This is true for all the jump detection tests. The ability of each test to correctly detect jumps is stronger when the jumps in prices and volatility have negative correlations, but as the correlation becomes more positive, each test becomes more spurious. The LM test proves to be more sensitive to changes in the parameter value than the combination tests, but less so than the swap variance tests.

At the higher sampling frequencies and lower parameter values, the combination tests experience increasing PPVs, while the LM test experiences decreasing PPVs. This contributes to the combination tests experiencing improved performances relative to the LM test. However, for parameter values exceeding 0.3, the combination tests too start to experience declining PPVs. Additionally, at the higher sampling frequencies and for negative correlations, the LM test's TPRs rank notably lower than the TPRs of the combination tests, contributing to the LM test's overall lower rank. As the parameter values increases, all jump detection tests experience declining TPRs, but this is less severe for the LM test. As a result, compared to the other tests, the LM experiences higher TPRs at the higher parameter values and lower sampling frequencies, which drives the improvement in its overall rank, as indicated in Table 11.

Across all sampling frequencies, the swap variance tests emerge as the worst performing jump detection tests. This is driven by their relatively low PPVs and TNRs. At the 30-second sampling frequency, for parameter values exceeding 0.3, the CPR test's performance is worse than those of the swap variance tests; hence, it emerges as the overall lowest ranking test. Over this range, the CPR test produces lower TPRs, TNRs, PPVs and NPVs than the swap variance tests. For strong positive correlations, the MIN test experiences the lowest BMI performance. This is attributed to its TPR, suggesting that the MIN test becomes relatively more spurious when there are strong positive correlations between the price and volatility jumps. This too contributes to the decline in the overall rank of the MIN-RATIO test over this range.

Chapter 7

Conclusion

This dissertation set out to compare the absolute and relative performances of existing non-parametric finite activity jump detection tests and combinations thereof, under different scenarios. The performance of each jump detection test is measured by metrics used to evaluate binary classifiers in machine learning, namely the Matthews correlation coefficient and bookmaker informedness, as well as a combination of the two. The jump detection tests are treated as binary classifiers with positive condition *jump* and negative condition *non-jump*. This classification rule is applied to the asset returns processes and compared against the simulated jump times, allowing for the construction of confusion matrices.

The jump detection tests are used on high-frequency simulated data, which is generated by three data generating processes, namely the Merton, Bates and SVJJ models and sampled at the 30-second, 1-minute, 5-minute and 15-minute sampling frequencies. The former two being the higher sampling frequencies and the latter two the lower sampling frequencies. Additionally, the comparison is conducted over various parameter values, where a number of parameters under each model are stressed one-at-a-time.

Generally, the absolute performances of the LM test are consistently strong. Consequently, it emerges as the most accurate jump detection test in most scenarios. This, coupled with its ability to implicitly detect the exact time, size and direction of jumps, makes it an optimal jump detection test to use. However, when asset prices with stochastic volatility experience particularly high levels of volatility, the LM test experiences an inability to adequately disentangle the diffusion and jump components. This jump detection test becomes particularly spurious, especially under the Bates model, detecting many false positives. Therefore, it is not recommended to use the LM test to detect jumps when the volatility-of-volatility parameter is extremely high under stochastic diffusion models.

Despite being sensitive to the volatility-of-volatility parameter, the LM test is generally less sensitive to changes in the remaining variable parameters when compared to the other jump detection tests. Generally, the swap variance tests are the most sensitive to changes in the parameter values. This sensitivity filters into the combination tests, of which the RATIO swap variance test is a constituent. As a result, in a number of scenarios, irrespective of the LM test's strong absolute performance, relatively it is outranked by some of the other jump detection tests, particularly the combination tests. These scenarios include, (1) when the constant volatility under the Merton model is extremely low, (2) when the price jump volatility under the SVJJ model is particularly low, notably at the higher sampling frequencies and to a lesser extent at the 5-minute sampling frequency, (3) when the price jump mean is high, notably at the lower sampling frequencies, (4) under the SVJJ model, for all values of the jump intensity and volatility jump rate, at the higher sampling frequencies and (5) when the correlation between the price and volatility jumps under the SVJJ model ranges from a strong negative to positive, at the higher sampling frequencies and to a much lesser extent at the 5-minute sampling frequency. Despite this, if one is interested in the exact timing and size of the jumps, it is still recommended to use the LM test.

All the jump detection tests experience difficulty in accurately detecting small jumps in asset prices. Notably, the swap variance tests perform particularly well when detecting large jumps at the 15-minute sampling frequency, under the Merton and Bates models. In most other scenarios, the swap variance tests are the lowest ranking, with remarkably low absolute performances. At high volatilities and low sampling frequencies, the swap variance tests do not follow a standard normal distribution under the null hypothesis of no jumps. Irrespective, the combination tests, perform notably well over these ranges.

The combination tests outperform their constituents in all scenarios, except when the jump sizes are extremely large. These jump detection tests are less spurious than their constituents, particularly the RATIO test. This, coupled with their ability to detect the jump direction, makes them a viable replacement for the LM test when it performs poorly. In particular, the combination tests produce strong BMI performances, which are comparable to that of the LM test, even outranking the LM test under some scenarios. At the higher sampling frequencies, it is specifically the MED-RATIO combination test whose overall performance outranks that of the other combination tests and at times emerges as the highest ranking jump detection test. Similarly, for the MIN-RATIO combination test at the lower sampling frequencies.

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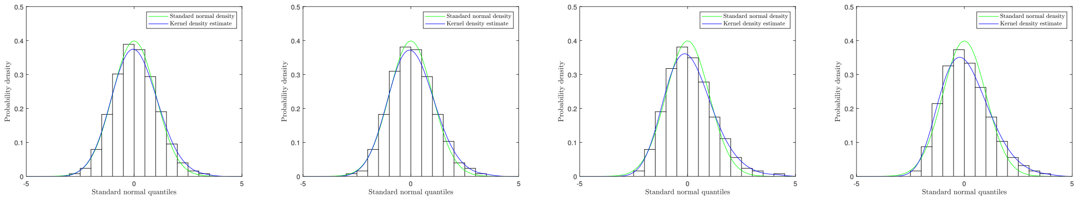
Appendix A

Jump detection tests: asymptotic statistical distributions

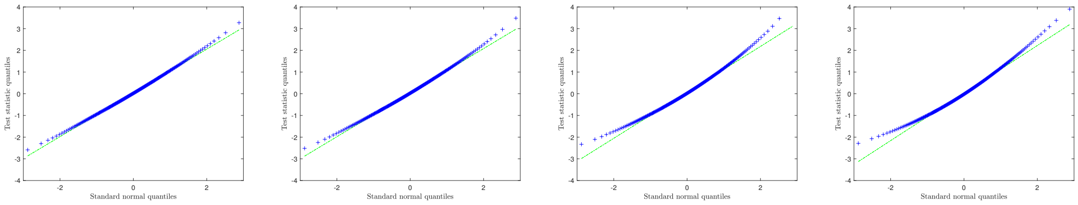
A total of $1\ 000$ sample asset price paths are generated under the Bates model with no jump component. The non-jump parameter values calibrated in Duffie *et al.* (2000), subject to Section 4.2, are used to generate the data. $S_0 = 100$, $r = 0.1$, $\sigma_S = 0$, $\mu_S = 0$, $\lambda = 0$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$, $\rho = -0.79$ with two values for the volatility-of-volatility parameter, $\sigma_V = 0.27$ and $\sigma_V = 0.8$. See Section 4.1.2 for the relevant dynamics and a description thereof. The BNS, ABD, MIN, MED, CPR, DIFF, LOG and RATIO test statistics are applied to the resulting returns processes. See Section 4.3 for definitions of these jump detection tests. The distributions of these jump detection tests' test statistics under the null hypothesis of no jumps are plotted against the standard normal distribution by means of density and Q-Q plots. Additionally, the Kolmogorov-Smirnov goodness of fit test, at a 5% significance level, is performed on the test statistics. Massey Jr (1951) explains that this test looks at the maximum difference between the empirical distribution of the test statistics and the standard normal distribution. The null hypothesis under the Kolmogorov-Smirnov goodness of fit test is that the empirical distribution is standard normal. If the test statistic follows a standard normal distribution, then the Kolmogorov-Smirnov test statistic will be close to zero. Moreover, the mean, standard deviation, kurtosis and skewness for the empirical distributions of the test statistics under the null hypothesis of no jumps are calculated.

It is the asymptotic distributional properties of the jump detection tests' test statistics under the null hypothesis of no jumps, which allow standard hypothesis testing to be used when detecting jumps. Therefore, it is important to verify that the tests statistics do in fact follow an asymptotic standard normal distribution under the null hypothesis of no jumps.

See Section 2.1 for the distribution of the BNS test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.

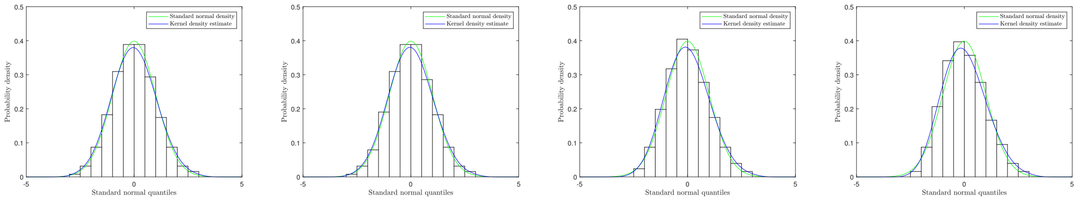


(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

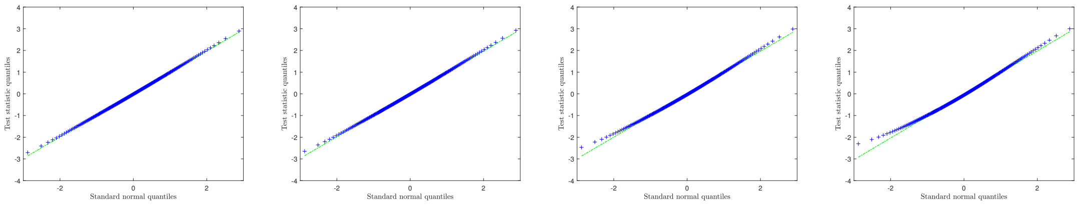


(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 3 Distribution of the BNS test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.

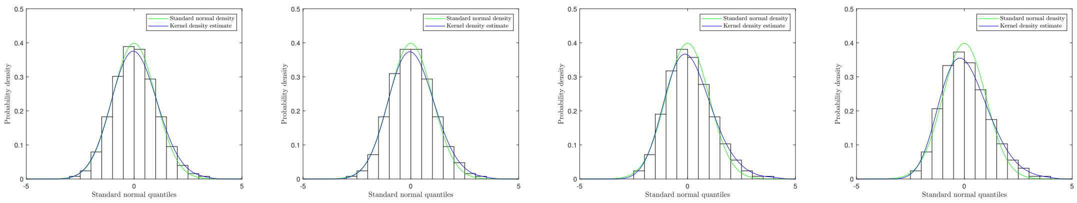


(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

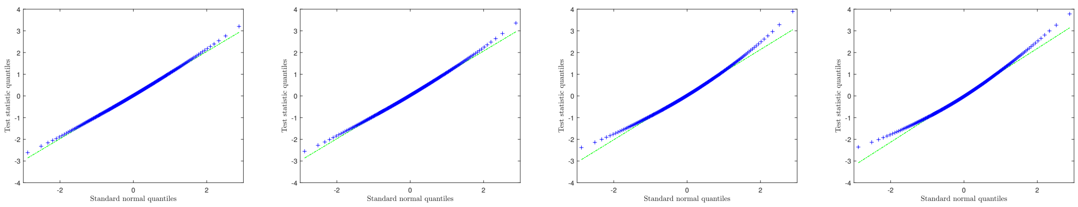


(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 4 Distribution of the ABD test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.

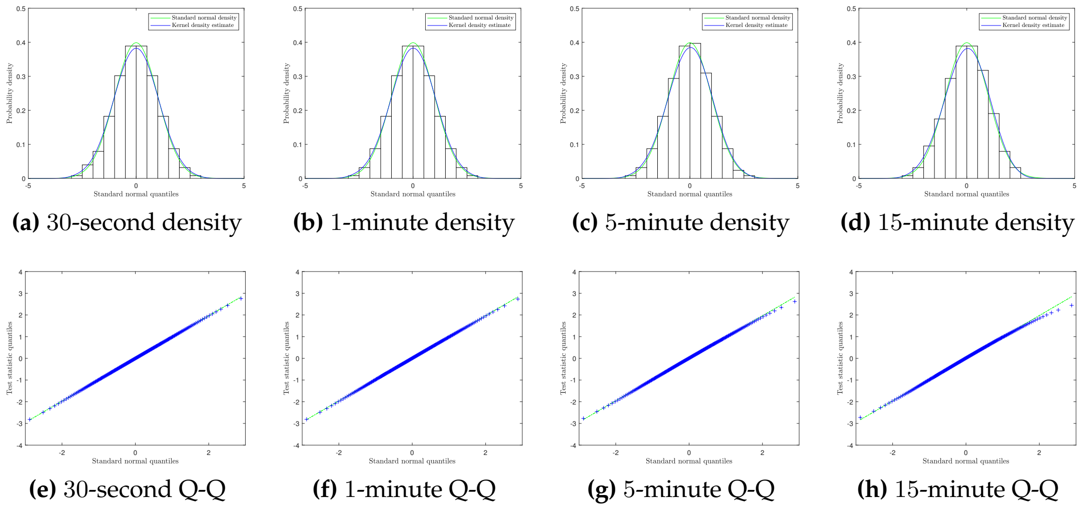


(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density



(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

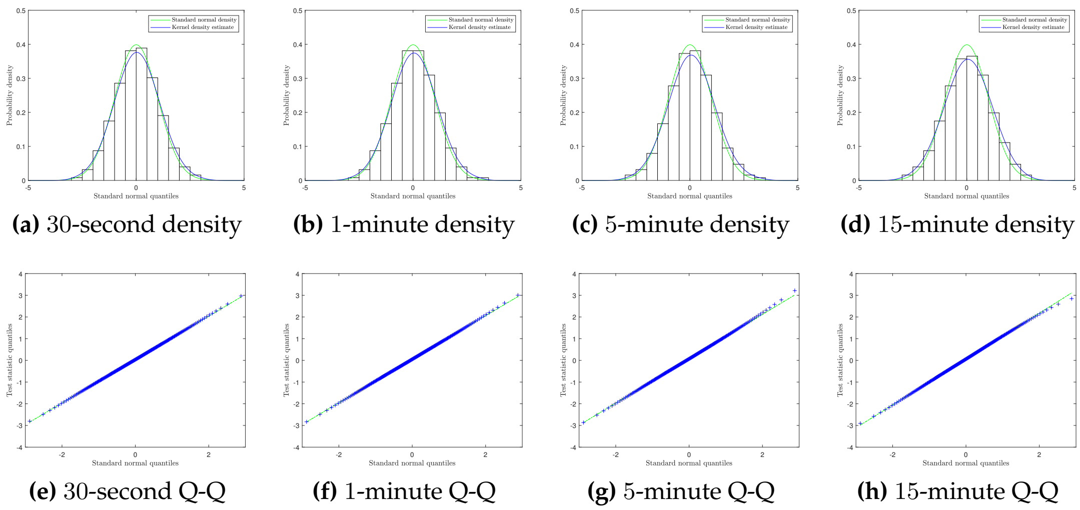
Figure 5 Distribution of the ABD test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

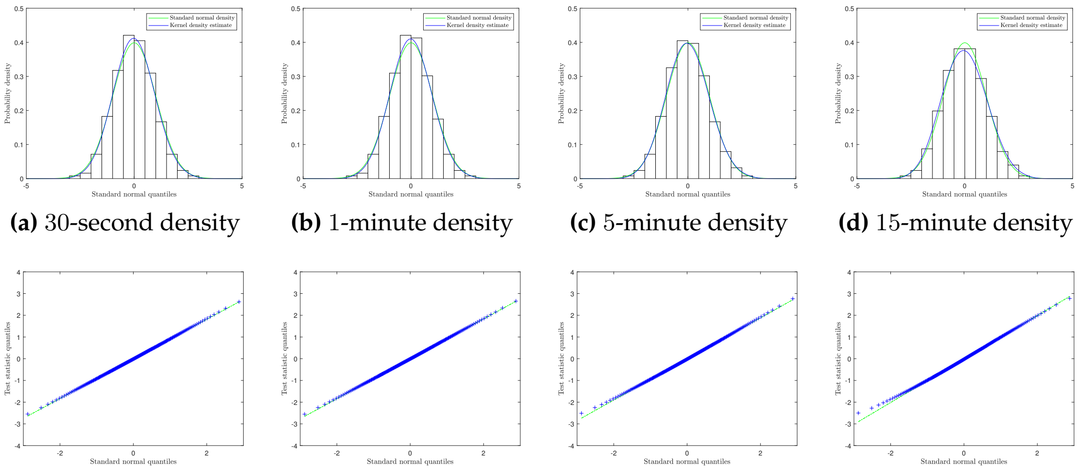
Figure 6 Distribution of the MIN test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

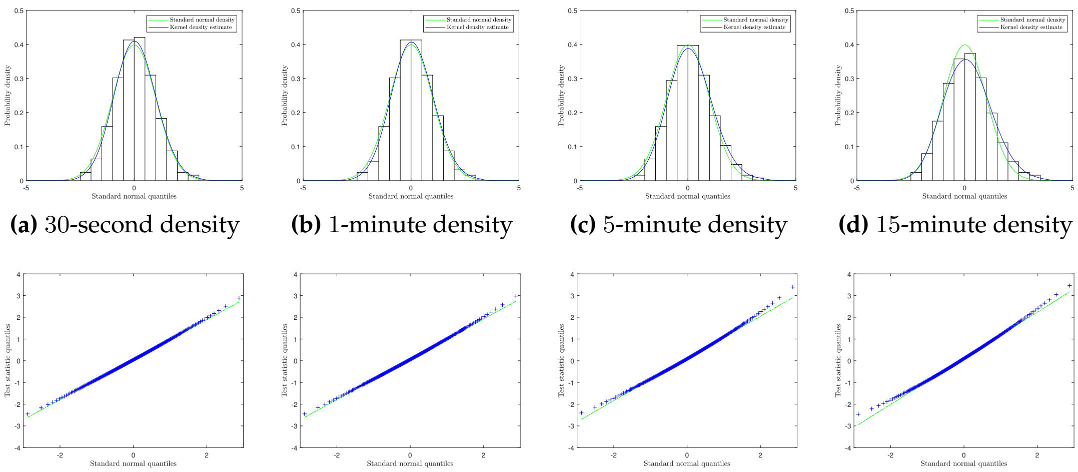
Figure 7 Distribution of the MIN test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

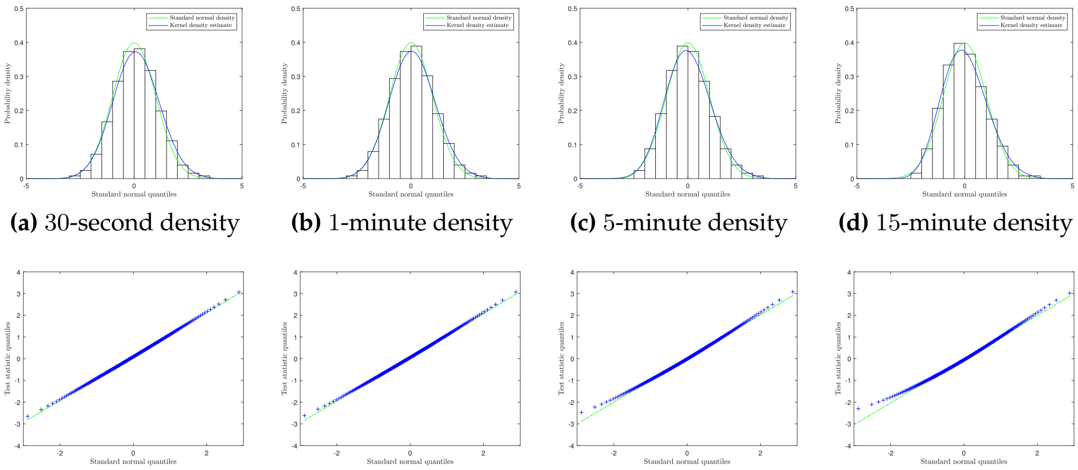
Figure 8 Distribution of the MED test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

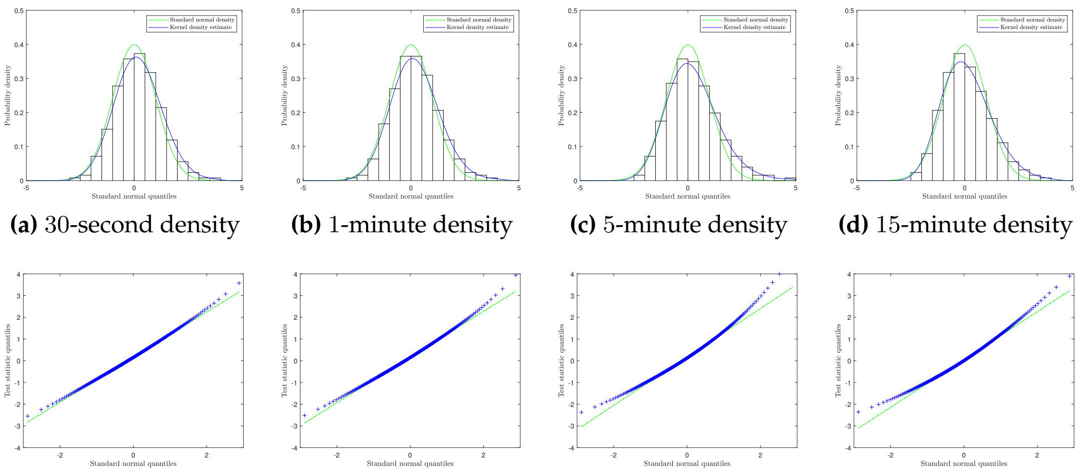
Figure 9 Distribution of the MED test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

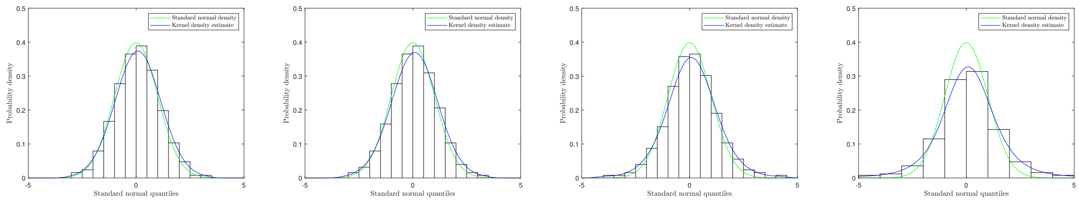
Figure 10 Distribution of the CPR test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.



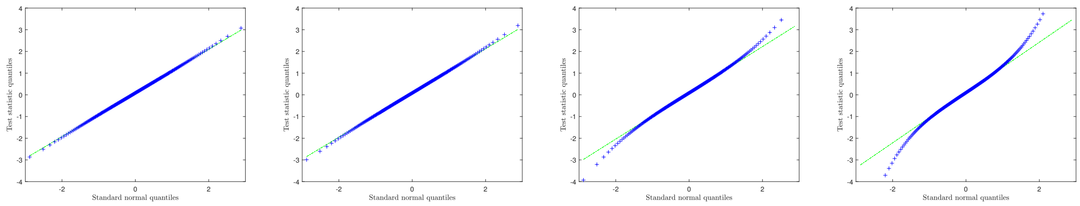
(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 11 Distribution of the CPR test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.

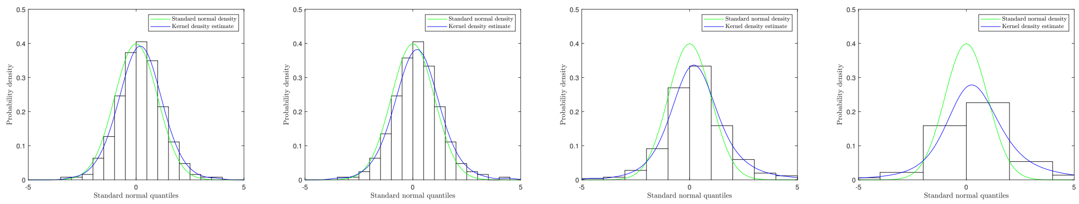


(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

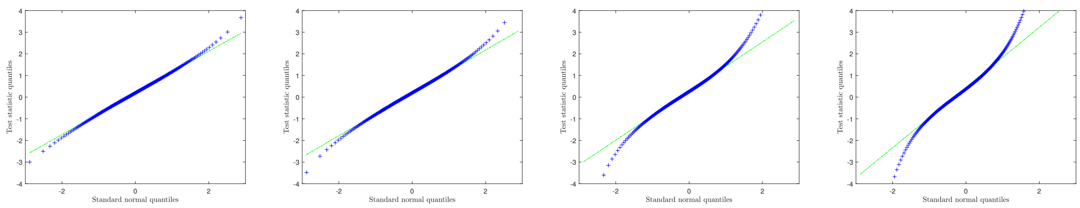


(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 12 Distribution of the DIFF test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.

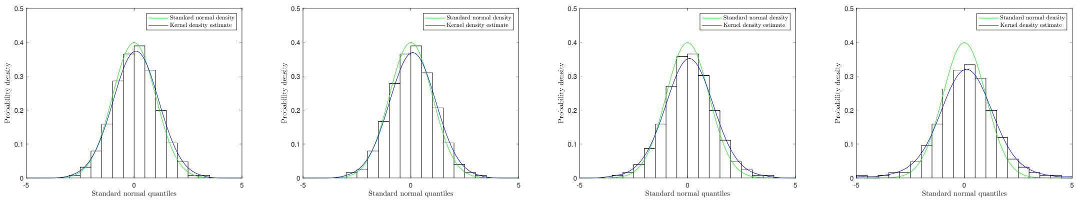


(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density



(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 13 Distribution of the DIFF test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.



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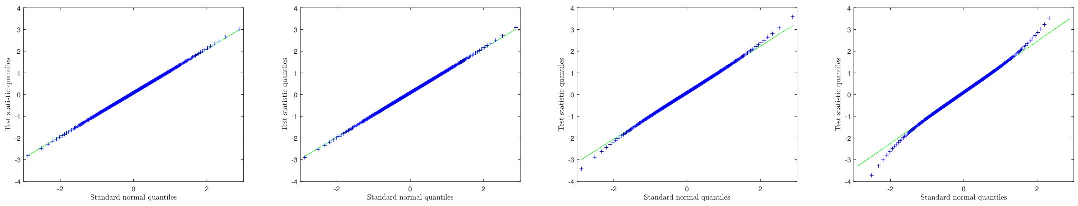
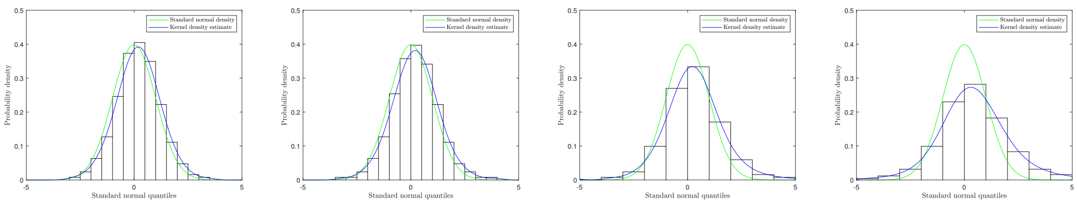


(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 14 Distribution of the LOG test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.



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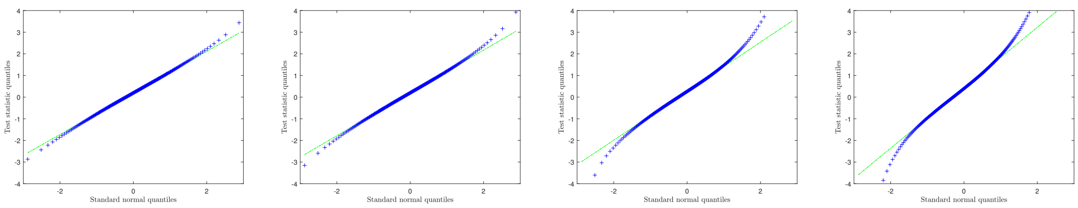
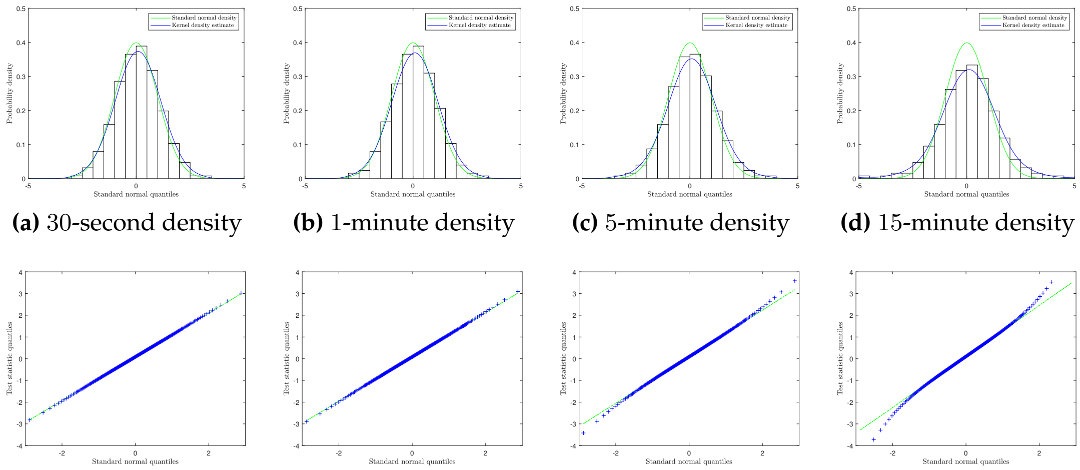


(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

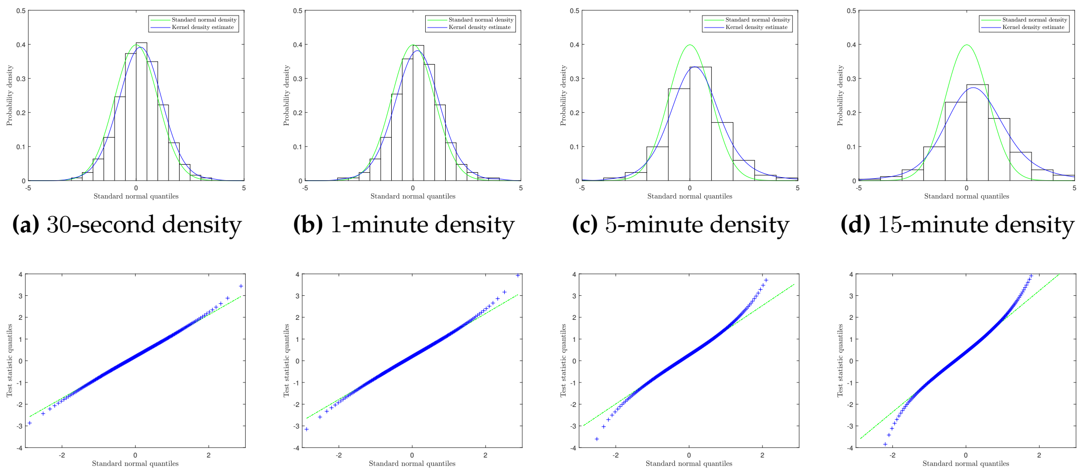
Figure 15 Distribution of the LOG test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 16 Distribution of the RATIO test statistic under the Bates model with $\sigma_V = 0.27$ and no jump component.



(a) 30-second density **(b)** 1-minute density **(c)** 5-minute density **(d)** 15-minute density

(e) 30-second Q-Q **(f)** 1-minute Q-Q **(g)** 5-minute Q-Q **(h)** 15-minute Q-Q

Figure 17 Distribution of the RATIO test statistic under the Bates model with $\sigma_V = 0.8$ and no jump component.

Table 12 Summary statistics for the jump detection tests' test statistics under the Bates model with $\sigma_V = 0.27$ and no jump component.

Test	Sampling frequency	Mean	Standard deviation	Kurtosis	Skewness	Kolmogorov-Smirnov test [1] Test statistic (p-value)	Conclusion [2]
BNS	30-second	0.0021	0.9861	2.8885	0.0871	0.0082 (1.0000)	Fail to reject H0
	1-minute	0.0072	0.9831	2.8840	0.1177	0.0096 (1.0000)	Fail to reject H0
	5-minute	0.0094	0.9777	2.8774	0.2365	0.0160 (1.0000)	Fail to reject H0
	15-minute	0.0096	0.9791	2.8566	0.3381	0.0243 (0.9975)	Fail to reject H0
ABD	30-second	0.0005	0.9877	2.8907	0.0780	0.0082 (1.0000)	Fail to reject H0
	1-minute	0.0050	0.9852	2.8865	0.1053	0.0084 (1.0000)	Fail to reject H0
	5-minute	0.0053	0.9813	2.8760	0.2140	0.0160 (1.0000)	Fail to reject H0
	15-minute	0.0033	0.9830	2.8385	0.3023	0.0245 (0.9973)	Fail to reject H0
MIN	30-second	-0.0053	0.9835	2.8890	-0.0191	0.0073 (1.0000)	Fail to reject H0
	1-minute	-0.0008	0.9804	2.8831	-0.0343	0.0075 (1.0000)	Fail to reject H0
	5-minute	-0.0033	0.9700	2.8327	-0.0620	0.0100 (1.0000)	Fail to reject H0
	15-minute	-0.0059	0.9630	2.7355	-0.1085	0.0125 (1.0000)	Fail to reject H0
MED	30-second	-0.0053	0.9120	2.8893	0.0460	0.0256 (0.9951)	Fail to reject H0
	1-minute	-0.0012	0.9149	2.8853	0.0443	0.0231 (0.9989)	Fail to reject H0
	5-minute	-0.0031	0.9391	2.8646	0.0976	0.0180 (1.0000)	Fail to reject H0
	15-minute	-0.0040	0.9739	2.7482	0.1143	0.0125 (1.0000)	Fail to reject H0
CPR	30-second	0.1060	1.0087	2.8912	0.0816	0.0389 (0.8257)	Fail to reject H0
	1-minute	0.0775	1.0049	2.8945	0.1124	0.0257 (0.9948)	Fail to reject H0
	5-minute	0.0304	0.9960	2.8877	0.2248	0.0140 (1.0000)	Fail to reject H0
	15-minute	0.0072	0.9864	2.8417	0.3050	0.0231 (0.9989)	Fail to reject H0
DIFF	30-second	0.0871	1.0180	2.9891	0.0078	0.0370 (0.8683)	Fail to reject H0
	1-minute	0.0867	1.0374	3.0673	0.0048	0.0370 (0.8685)	Fail to reject H0
	5-minute	0.0941	1.1711	3.8091	0.0270	0.0434 (0.7130)	Fail to reject H0
	15-minute	0.1167	1.5334	6.7033	0.1093	0.0697 (0.1648)	Fail to reject H0
LOG	30-second	0.0869	1.0132	2.9434	0.0047	0.0371 (0.8666)	Fail to reject H0
	1-minute	0.0863	1.0278	2.9794	0.0012	0.0371 (0.8647)	Fail to reject H0
	5-minute	0.0916	1.1158	3.2776	0.0032	0.0455 (0.6555)	Fail to reject H0
	15-minute	0.1071	1.3117	4.2650	0.0301	0.0677 (0.1895)	Fail to reject H0
RATIO	30-second	0.0869	1.0132	2.9434	0.0047	0.0371 (0.8666)	Fail to reject H0
	1-minute	0.0863	1.0278	2.9794	0.0012	0.0371 (0.8647)	Fail to reject H0
	5-minute	0.0916	1.1158	3.2776	0.0029	0.0455 (0.6557)	Fail to reject H0
	15-minute	0.1069	1.3117	4.2650	0.0291	0.0677 (0.1899)	Fail to reject H0

Data simulated using 1 000 replications and parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0$, $\mu_S = 0$, $\lambda = 0$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$.

[1] A Kolmogorov-Smirnov test statistic close to zero indicates that the test statistic of the jump detection test follows a standard normal distribution when no jumps are present in the asset price process.

[2] The null hypothesis, H0, under the Kolmogorov-Smirnov goodness of fit test is that the empirical distribution is standard normal.

Table 13 Summary statistics for the jump detection tests' test statistics under the Bates model with $\sigma_V = 0.8$ and no jump component.

Test	Sampling frequency	Mean	Standard deviation	Kurtosis	Skewness	Kolmogorov-Smirnov test [1] Test dtatistic (p-value)	Kolmogorov-Smirnov test [1] Conclusion [2]
BNS	30-second	0.0575	1.0111	3.0011	0.2104	0.0177 (1.0000)	Fail to reject H0
	1-minute	0.0772	1.0230	3.0978	0.2947	0.0230 (0.9990)	Fail to reject H0
	5-minute	0.1186	1.0819	3.4569	0.5567	0.0414 (0.7635)	Fail to reject H0
	15-minute	0.0893	1.0971	3.2218	0.5492	0.0437 (0.7037)	Fail to reject H0
ABD	30-second	0.0524	1.0071	2.9777	0.1812	0.0160 (1.0000)	Fail to reject H0
	1-minute	0.0696	1.0148	3.0412	0.2468	0.0202 (0.9999)	Fail to reject H0
	5-minute	0.1054	1.0585	3.3168	0.4784	0.0355 (0.8973)	Fail to reject H0
	15-minute	0.0802	1.0819	3.1630	0.4933	0.0396 (0.8100)	Fail to reject H0
MIN	30-second	0.0397	1.0047	2.9364	0.0210	0.0167 (1.0000)	Fail to reject H0
	1-minute	0.0541	1.0105	2.9551	0.0196	0.0227 (0.9992)	Fail to reject H0
	5-minute	0.0787	1.0375	3.0118	0.0536	0.0318 (0.9541)	Fail to reject H0
	15-minute	0.0575	1.0488	2.8105	-0.0438	0.0343 (0.9175)	Fail to reject H0
MED	30-second	0.0613	0.9245	2.9560	0.1239	0.0382 (0.8412)	Fail to reject H0
	1-minute	0.0810	0.9327	2.9869	0.1476	0.0419 (0.7509)	Fail to reject H0
	5-minute	0.1314	0.9861	3.0967	0.2711	0.0436 (0.7071)	Fail to reject H0
	15-minute	0.1439	1.0533	2.9461	0.2660	0.0488 (0.5683)	Fail to reject H0
CPR	30-second	0.1908	1.0472	3.0407	0.2172	0.0648 (0.2299)	Fail to reject H0
	1-minute	0.2026	1.0733	3.2321	0.3326	0.0651 (0.2260)	Fail to reject H0
	5-minute	0.2422	1.1659	3.7253	0.6448	0.0758 (0.1051)	Fail to reject H0
	15-minute	0.1112	1.1051	3.1878	0.5106	0.0488 (0.5684)	Fail to reject H0
DIFF	30-second	0.1968	1.0179	3.4505	0.0517	0.0835 (0.0563)	Fail to reject H0
	1-minute	0.2089	1.0870	4.0490	0.1532	0.0821 (0.0635)	Fail to reject H0
	5-minute	0.3499	1.6672	12.4021	0.9944	0.1062 (0.0063)	Reject H0
	15-minute	0.5829	3.1917	34.1672	1.2468	0.1729 (0.0000)	Reject H0
LOG	30-second	0.1940	1.0014	3.2687	0.0199	0.0834 (0.0566)	Fail to reject H0
	1-minute	0.2036	1.0515	3.5744	0.0858	0.0821 (0.0634)	Fail to reject H0
	5-minute	0.3206	1.4106	6.9516	0.5902	0.1092 (0.0045)	Reject H0
	15-minute	0.5020	2.0667	14.6780	0.7339	0.1770 (0.0000)	Reject H0
RATIO	30-second	0.1940	1.0014	3.2687	0.0199	0.0834 (0.0566)	Fail to reject H0
	1-minute	0.2036	1.0515	3.5744	0.0857	0.0821 (0.0634)	Fail to reject H0
	5-minute	0.3206	1.4106	6.9515	0.5900	0.1092 (0.0045)	Reject H0
	15-minute	0.5018	2.0667	14.6774	0.7332	0.1770 (0.0000)	Reject H0

Data simulated using 1 000 replications and parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.8$, $\sigma_S = 0$, $\mu_S = 0$, $\lambda = 0$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$.

[1] A Kolmogorov-Smirnov test statistic close to zero indicates that the test statistic of the jump detection test follows a standard normal distribution when no jumps are present in the asset price process.

[2] The null hypothesis, H0, under the Kolmogorov-Smirnov goodness of fit test is that the empirical distribution is standard normal.

Appendix B

Bates model: tabulated results

At each sampling frequency, the stress ranges of the variable parameters under the Bates model, which are stressed one-at-a-time, are each divided into a number of parameter categories. The categories are chosen such that every jump detection test produces similar absolute and relative performances across the parameter values within each category. Five random values from each parameter category are sampled. The average and standard deviation (in parenthesis) of these five values are tabulated below, which provide the absolute performances of the jump detection tests under the Bates model. The other parameters are held constant at their calibrated values presented in Table 3, subject to Section 4.2.

Additionally, heat maps for each parameter category are superimposed on the tabulated results, which provide the relative performances of the jump detection tests, per parameter category, under the Bates model. The relative MCC performances are displayed in green and the relative BMI performances in blue. The darker the shade, the higher the rank of the jump detection test. As the colour fades, the rank of the jump detection test declines. The absolute and relative sensitivity of each jump detection test to changes in the variable parameter values can be examined. For both the MCC and BMI, changes in the relative performances of the jump detection tests can be observed across the parameter categories (rows), as well as per parameter category (columns). Moreover, the MCC and BMI rankings of each jump detection test, for every parameter category, can be directly compared. A light green and dark blue combination implies that the jump detection test's MCC performance ranks low, while its BMI performance ranks high, over that parameter category.

B.1 Volatility-of-volatility parameter: σ_V

Table 14 Jump detection test performances when σ_V is stressed under the Bates model at the 30-second sampling frequency.

	σ_V					
	[0, 0.33)	**[0.33, 0.45)**	**[0.45, 0.6)**	**[0.6, 0.7)**	**[0.7, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9963 (0.0002)	0.9414 (0.0405)	0.7069 (0.0861)	0.4706 (0.0356)	0.3648 (0.0215)	0.2860 (0.0242)
MED-RATIO	0.9904 (0.0008)	0.9849 (0.0011)	0.9811 (0.0009)	0.9799 (0.0002)	0.9806 (0.0003)	0.9804 (0.0003)
MIN-RATIO	0.9883 (0.0017)	0.9778 (0.0020)	0.9736 (0.0008)	0.9745 (0.0006)	0.9764 (0.0003)	0.9779 (0.0007)
ABD-RATIO	0.9855 (0.0022)	0.9724 (0.0026)	0.9646 (0.0018)	0.9641 (0.0008)	0.9662 (0.0006)	0.9679 (0.0007)
BNS-RATIO	0.9855 (0.0021)	0.9720 (0.0028)	0.9634 (0.0018)	0.9626 (0.0004)	0.9649 (0.0007)	0.9668 (0.0007)
CPR-RATIO	0.9822 (0.0033)	0.9641 (0.0032)	0.9537 (0.0019)	0.9530 (0.0006)	0.9553 (0.0008)	0.9580 (0.0019)
MED	0.9380 (0.0006)	0.9384 (0.0002)	0.9392 (0.0003)	0.9422 (0.0010)	0.9450 (0.0002)	0.9464 (0.0012)
MIN	0.9120 (0.0001)	0.9105 (0.0007)	0.9129 (0.0008)	0.9181 (0.0014)	0.9239 (0.0013)	0.9294 (0.0019)
ABD	0.8921 (0.0004)	0.8903 (0.0006)	0.8909 (0.0012)	0.8965 (0.0016)	0.9021 (0.0018)	0.9082 (0.0017)
BNS	0.8913 (0.0001)	0.8891 (0.0006)	0.8889 (0.0012)	0.8942 (0.0011)	0.8997 (0.0018)	0.9059 (0.0015)
CPR	0.8542 (0.0002)	0.8523 (0.0002)	0.8544 (0.0020)	0.8625 (0.0016)	0.8696 (0.0022)	0.8778 (0.0029)
RATIO	0.7283 (0.0392)	0.5265 (0.0323)	0.4207 (0.0255)	0.3559 (0.0095)	0.3285 (0.0054)	0.3101 (0.0048)
LOG	0.7282 (0.0392)	0.5265 (0.0323)	0.4207 (0.0255)	0.3559 (0.0095)	0.3285 (0.0054)	0.3101 (0.0048)
DIFF	0.7210 (0.0389)	0.5237 (0.0315)	0.4200 (0.0248)	0.3575 (0.0089)	0.3317 (0.0049)	0.3160 (0.0036)
BMI						
LM	0.9940 (0.0001)	0.9944 (0.0001)	0.9945 (0.0001)	0.9944 (0.0000)	0.9942 (0.0001)	0.9942 (0.0001)
MED-RATIO	0.9923 (0.0004)	0.9931 (0.0001)	0.9931 (0.0001)	0.9930 (0.0001)	0.9932 (0.0000)	0.9935 (0.0002)
MIN-RATIO	0.9913 (0.0002)	0.9915 (0.0001)	0.9916 (0.0001)	0.9922 (0.0001)	0.9923 (0.0001)	0.9930 (0.0004)
ABD-RATIO	0.9919 (0.0002)	0.9917 (0.0001)	0.9913 (0.0001)	0.9915 (0.0001)	0.9917 (0.0001)	0.9922 (0.0002)
BNS-RATIO	0.9920 (0.0001)	0.9917 (0.0001)	0.9914 (0.0001)	0.9914 (0.0001)	0.9916 (0.0001)	0.9922 (0.0002)
CPR-RATIO	0.9926 (0.0001)	0.9916 (0.0001)	0.9907 (0.0001)	0.9909 (0.0001)	0.9911 (0.0001)	0.9919 (0.0005)
MED	0.9871 (0.0004)	0.9885 (0.0002)	0.9889 (0.0001)	0.9892 (0.0001)	0.9896 (0.0000)	0.9901 (0.0003)
MIN	0.9835 (0.0002)	0.9844 (0.0002)	0.9852 (0.0003)	0.9862 (0.0002)	0.9867 (0.0001)	0.9879 (0.0004)
ABD	0.9820 (0.0002)	0.9828 (0.0001)	0.9831 (0.0002)	0.9840 (0.0002)	0.9847 (0.0002)	0.9857 (0.0003)
BNS	0.9821 (0.0002)	0.9827 (0.0001)	0.9831 (0.0002)	0.9838 (0.0002)	0.9845 (0.0002)	0.9855 (0.0003)
CPR	0.9783 (0.0002)	0.9786 (0.0002)	0.9789 (0.0003)	0.9802 (0.0003)	0.9812 (0.0003)	0.9826 (0.0006)
RATIO	0.9546 (0.0116)	0.8648 (0.0206)	0.7857 (0.0227)	0.7229 (0.0102)	0.6924 (0.0063)	0.6719 (0.0049)
LOG	0.9546 (0.0116)	0.8648 (0.0206)	0.7857 (0.0227)	0.7229 (0.0102)	0.6924 (0.0063)	0.6719 (0.0049)
DIFF	0.9531 (0.0118)	0.8639 (0.0205)	0.7859 (0.0220)	0.7258 (0.0093)	0.6979 (0.0055)	0.6818 (0.0031)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_V stressed five times per parameter category.

Table 15 Jump detection test performances when σ_V is stressed under the Bates model at the 1-minute sampling frequency.

	σ_V					
	[0, 0.33)	**[0.33, 0.45)**	**[0.45, 0.6)**	**[0.6, 0.7)**	**[0.7, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9942 (0.0002)	0.9566 (0.0263)	0.7909 (0.0671)	0.5904 (0.0338)	0.4843 (0.0238)	0.3933 (0.0294)
MED-RATIO	0.9874 (0.0009)	0.9810 (0.0010)	0.9769 (0.0013)	0.9758 (0.0002)	0.9758 (0.0002)	0.9765 (0.0007)
MIN-RATIO	0.9849 (0.0019)	0.9762 (0.0014)	0.9721 (0.0008)	0.9732 (0.0003)	0.9738 (0.0004)	0.9770 (0.0010)
ABD-RATIO	0.9816 (0.0028)	0.9675 (0.0022)	0.9620 (0.0013)	0.9618 (0.0005)	0.9630 (0.0006)	0.9663 (0.0007)
BNS-RATIO	0.9816 (0.0028)	0.9668 (0.0024)	0.9607 (0.0015)	0.9594 (0.0004)	0.9614 (0.0007)	0.9643 (0.0006)
CPR-RATIO	0.9774 (0.0035)	0.9602 (0.0030)	0.9514 (0.0012)	0.9513 (0.0004)	0.9534 (0.0005)	0.9568 (0.0011)
MED	0.9303 (0.0002)	0.9298 (0.0010)	0.9312 (0.0005)	0.9346 (0.0009)	0.9380 (0.0009)	0.9413 (0.0011)
MIN	0.9147 (0.0001)	0.9136 (0.0004)	0.9164 (0.0019)	0.9225 (0.0012)	0.9271 (0.0016)	0.9333 (0.0020)
ABD	0.8907 (0.0006)	0.8885 (0.0002)	0.8914 (0.0016)	0.8977 (0.0017)	0.9027 (0.0016)	0.9098 (0.0019)
BNS	0.8899 (0.0006)	0.8868 (0.0003)	0.8885 (0.0010)	0.8940 (0.0017)	0.9000 (0.0019)	0.9067 (0.0015)
CPR	0.8622 (0.0005)	0.8600 (0.0003)	0.8618 (0.0021)	0.8712 (0.0023)	0.8781 (0.0015)	0.8849 (0.0022)
RATIO	0.7195 (0.0381)	0.5229 (0.0323)	0.4164 (0.0256)	0.3489 (0.0103)	0.3190 (0.0059)	0.2973 (0.0065)
LOG	0.7195 (0.0381)	0.5229 (0.0323)	0.4164 (0.0256)	0.3489 (0.0103)	0.3190 (0.0059)	0.2973 (0.0065)
DIFF	0.7058 (0.0367)	0.5174 (0.0308)	0.4155 (0.0244)	0.3517 (0.0094)	0.3245 (0.0053)	0.3055 (0.0053)
BMI						
LM	0.9906 (0.0005)	0.9915 (0.0001)	0.9916 (0.0001)	0.9913 (0.0001)	0.9914 (0.0001)	0.9915 (0.0000)
MED-RATIO	0.9903 (0.0001)	0.9908 (0.0002)	0.9911 (0.0000)	0.9912 (0.0001)	0.9913 (0.0000)	0.9919 (0.0004)
MIN-RATIO	0.9890 (0.0002)	0.9891 (0.0002)	0.9896 (0.0002)	0.9904 (0.0002)	0.9906 (0.0001)	0.9913 (0.0004)
ABD-RATIO	0.9897 (0.0001)	0.9894 (0.0002)	0.9898 (0.0001)	0.9899 (0.0001)	0.9902 (0.0001)	0.9913 (0.0004)
BNS-RATIO	0.9899 (0.0001)	0.9896 (0.0002)	0.9899 (0.0001)	0.9899 (0.0001)	0.9903 (0.0002)	0.9913 (0.0004)
CPR-RATIO	0.9902 (0.0001)	0.9899 (0.0002)	0.9893 (0.0001)	0.9897 (0.0002)	0.9903 (0.0001)	0.9909 (0.0004)
MED	0.9850 (0.0001)	0.9859 (0.0003)	0.9866 (0.0001)	0.9871 (0.0001)	0.9876 (0.0001)	0.9884 (0.0004)
MIN	0.9821 (0.0002)	0.9828 (0.0002)	0.9839 (0.0004)	0.9853 (0.0003)	0.9859 (0.0001)	0.9869 (0.0005)
ABD	0.9803 (0.0001)	0.9809 (0.0003)	0.9820 (0.0003)	0.9830 (0.0003)	0.9838 (0.0002)	0.9852 (0.0005)
BNS	0.9804 (0.0001)	0.9809 (0.0003)	0.9819 (0.0002)	0.9827 (0.0004)	0.9837 (0.0003)	0.9851 (0.0005)
CPR	0.9777 (0.0003)	0.9785 (0.0001)	0.9790 (0.0004)	0.9804 (0.0004)	0.9817 (0.0002)	0.9829 (0.0006)
RATIO	0.9509 (0.0116)	0.8621 (0.0209)	0.7813 (0.0235)	0.7134 (0.0118)	0.6777 (0.0073)	0.6506 (0.0079)
LOG	0.9509 (0.0116)	0.8621 (0.0209)	0.7813 (0.0235)	0.7134 (0.0118)	0.6777 (0.0073)	0.6506 (0.0079)
DIFF	0.9480 (0.0116)	0.8604 (0.0204)	0.7821 (0.0223)	0.7187 (0.0105)	0.6874 (0.0064)	0.6654 (0.0056)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_V stressed five times per parameter category.

Table 16 Jump detection test performances when σ_V is stressed under the Bates model at the 5-minute sampling frequency.

	σ_V					
	[0, 0.33)	**[0.33, 0.45)**	**[0.45, 0.6)**	**[0.6, 0.7)**	**[0.7, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9879 (0.0005)	0.9713 (0.0085)	0.9203 (0.0226)	0.8418 (0.0168)	0.7824 (0.0159)	0.7153 (0.0254)
MED-RATIO	0.9680 (0.0021)	0.9609 (0.0007)	0.9599 (0.0004)	0.9615 (0.0008)	0.9619 (0.0002)	0.9621 (0.0007)
MIN-RATIO	0.9717 (0.0009)	0.9664 (0.0004)	0.9647 (0.0006)	0.9666 (0.0010)	0.9687 (0.0002)	0.9713 (0.0013)
ABD-RATIO	0.9573 (0.0022)	0.9462 (0.0015)	0.9436 (0.0004)	0.9457 (0.0009)	0.9484 (0.0006)	0.9517 (0.0006)
BNS-RATIO	0.9571 (0.0022)	0.9454 (0.0015)	0.9425 (0.0005)	0.9442 (0.0007)	0.9471 (0.0005)	0.9503 (0.0005)
CPR-RATIO	0.9514 (0.0023)	0.9392 (0.0013)	0.9363 (0.0004)	0.9384 (0.0009)	0.9416 (0.0006)	0.9452 (0.0007)
MED	0.9102 (0.0004)	0.9126 (0.0011)	0.9173 (0.0015)	0.9236 (0.0016)	0.9267 (0.0011)	0.9305 (0.0008)
MIN	0.9237 (0.0004)	0.9250 (0.0006)	0.9281 (0.0017)	0.9345 (0.0017)	0.9387 (0.0008)	0.9434 (0.0013)
ABD	0.8735 (0.0003)	0.8744 (0.0013)	0.8813 (0.0021)	0.8894 (0.0017)	0.8960 (0.0016)	0.9032 (0.0019)
BNS	0.8726 (0.0002)	0.8728 (0.0011)	0.8794 (0.0022)	0.8874 (0.0014)	0.8942 (0.0016)	0.9012 (0.0017)
CPR	0.8594 (0.0002)	0.8607 (0.0017)	0.8684 (0.0018)	0.8761 (0.0015)	0.8835 (0.0018)	0.8914 (0.0020)
RATIO	0.6545 (0.0296)	0.4971 (0.0275)	0.4009 (0.0252)	0.3326 (0.0107)	0.2991 (0.0075)	0.2708 (0.0089)
LOG	0.6544 (0.0296)	0.4971 (0.0275)	0.4009 (0.0252)	0.3325 (0.0107)	0.2991 (0.0075)	0.2708 (0.0089)
DIFF	0.6117 (0.0265)	0.4823 (0.0200)	0.4228 (0.0117)	0.3992 (0.0021)	0.3954 (0.0001)	0.3985 (0.0022)
BMI						
LM	0.9796 (0.0002)	0.9809 (0.0003)	0.9820 (0.0004)	0.9832 (0.0001)	0.9833 (0.0001)	0.9838 (0.0002)
MED-RATIO	0.9811 (0.0002)	0.9818 (0.0002)	0.9828 (0.0006)	0.9843 (0.0004)	0.9849 (0.0001)	0.9855 (0.0003)
MIN-RATIO	0.9797 (0.0003)	0.9803 (0.0002)	0.9816 (0.0007)	0.9834 (0.0003)	0.9842 (0.0001)	0.9845 (0.0004)
ABD-RATIO	0.9799 (0.0002)	0.9803 (0.0001)	0.9811 (0.0007)	0.9831 (0.0004)	0.9843 (0.0002)	0.9854 (0.0003)
BNS-RATIO	0.9804 (0.0001)	0.9809 (0.0001)	0.9816 (0.0006)	0.9835 (0.0003)	0.9847 (0.0002)	0.9858 (0.0003)
CPR-RATIO	0.9817 (0.0002)	0.9818 (0.0001)	0.9824 (0.0007)	0.9842 (0.0002)	0.9853 (0.0001)	0.9861 (0.0003)
MED	0.9757 (0.0002)	0.9771 (0.0004)	0.9786 (0.0007)	0.9807 (0.0005)	0.9815 (0.0002)	0.9824 (0.0004)
MIN	0.9753 (0.0004)	0.9764 (0.0002)	0.9782 (0.0008)	0.9804 (0.0004)	0.9813 (0.0000)	0.9820 (0.0004)
ABD	0.9709 (0.0003)	0.9726 (0.0004)	0.9744 (0.0008)	0.9771 (0.0005)	0.9787 (0.0004)	0.9803 (0.0004)
BNS	0.9714 (0.0002)	0.9730 (0.0004)	0.9747 (0.0008)	0.9773 (0.0004)	0.9790 (0.0003)	0.9806 (0.0004)
CPR	0.9716 (0.0002)	0.9729 (0.0005)	0.9748 (0.0008)	0.9773 (0.0003)	0.9789 (0.0003)	0.9802 (0.0005)
RATIO	0.9310 (0.0111)	0.8494 (0.0195)	0.7702 (0.0248)	0.6943 (0.0139)	0.6481 (0.0112)	0.6045 (0.0145)
LOG	0.9310 (0.0111)	0.8494 (0.0195)	0.7702 (0.0248)	0.6942 (0.0138)	0.6480 (0.0112)	0.6044 (0.0145)
DIFF	0.9182 (0.0114)	0.8460 (0.0141)	0.8030 (0.0088)	0.7868 (0.0010)	0.7865 (0.0009)	0.7930 (0.0032)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_V stressed five times per parameter category.

Table 17 Jump detection test performances when σ_V is stressed under the Bates model at the 15-minute sampling frequency.

	σ_V					
	[0, 0.33)	**[0.33, 0.45)**	**[0.45, 0.6)**	**[0.6, 0.7)**	**[0.7, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9785 (0.0004)	0.9707 (0.0035)	0.9524 (0.0074)	0.9276 (0.0062)	0.9039 (0.0064)	0.8725 (0.0127)
MED-RATIO	0.9361 (0.0012)	0.9356 (0.0008)	0.9386 (0.0014)	0.9434 (0.0011)	0.9462 (0.0006)	0.9482 (0.0016)
MIN-RATIO	0.9576 (0.0005)	0.9586 (0.0005)	0.9603 (0.0010)	0.9632 (0.0009)	0.9657 (0.0004)	0.9679 (0.0007)
ABD-RATIO	0.9190 (0.0018)	0.9178 (0.0007)	0.9228 (0.0021)	0.9296 (0.0018)	0.9342 (0.0011)	0.9387 (0.0019)
BNS-RATIO	0.9176 (0.0021)	0.9155 (0.0009)	0.9211 (0.0022)	0.9278 (0.0018)	0.9325 (0.0011)	0.9375 (0.0021)
CPR-RATIO	0.9172 (0.0018)	0.9162 (0.0009)	0.9212 (0.0020)	0.9279 (0.0019)	0.9326 (0.0011)	0.9371 (0.0019)
MED	0.8937 (0.0007)	0.9000 (0.0020)	0.9084 (0.0031)	0.9172 (0.0017)	0.9220 (0.0009)	0.9259 (0.0022)
MIN	0.9337 (0.0006)	0.9385 (0.0012)	0.9429 (0.0021)	0.9493 (0.0013)	0.9530 (0.0008)	0.9561 (0.0010)
ABD	0.8554 (0.0008)	0.8640 (0.0021)	0.8751 (0.0041)	0.8882 (0.0030)	0.8960 (0.0021)	0.9044 (0.0031)
BNS	0.8528 (0.0008)	0.8604 (0.0025)	0.8726 (0.0041)	0.8860 (0.0028)	0.8937 (0.0021)	0.9025 (0.0031)
CPR	0.8532 (0.0006)	0.8616 (0.0023)	0.8730 (0.0041)	0.8864 (0.0030)	0.8943 (0.0021)	0.9027 (0.0031)
RATIO	0.5709 (0.0168)	0.5075 (0.0056)	0.4969 (0.0009)	0.5045 (0.0031)	0.5165 (0.0032)	0.5302 (0.0055)
LOG	0.5707 (0.0168)	0.5075 (0.0056)	0.4968 (0.0009)	0.5044 (0.0031)	0.5163 (0.0032)	0.5301 (0.0055)
DIFF	0.5019 (0.0130)	0.4570 (0.0026)	0.4578 (0.0037)	0.4750 (0.0048)	0.4921 (0.0047)	0.5134 (0.0084)
BMI						
LM	0.9631 (0.0009)	0.9661 (0.0002)	0.9675 (0.0004)	0.9690 (0.0002)	0.9697 (0.0002)	0.9702 (0.0001)
MED-RATIO	0.9668 (0.0005)	0.9692 (0.0007)	0.9710 (0.0004)	0.9725 (0.0004)	0.9739 (0.0002)	0.9743 (0.0004)
MIN-RATIO	0.9558 (0.0012)	0.9604 (0.0005)	0.9615 (0.0009)	0.9643 (0.0006)	0.9663 (0.0003)	0.9675 (0.0004)
ABD-RATIO	0.9646 (0.0003)	0.9663 (0.0004)	0.9682 (0.0007)	0.9710 (0.0007)	0.9724 (0.0002)	0.9735 (0.0005)
BNS-RATIO	0.9660 (0.0001)	0.9674 (0.0004)	0.9694 (0.0007)	0.9721 (0.0008)	0.9737 (0.0002)	0.9749 (0.0006)
CPR-RATIO	0.9662 (0.0002)	0.9675 (0.0006)	0.9696 (0.0008)	0.9724 (0.0007)	0.9736 (0.0002)	0.9745 (0.0005)
MED	0.9625 (0.0007)	0.9655 (0.0007)	0.9678 (0.0006)	0.9698 (0.0005)	0.9714 (0.0002)	0.9720 (0.0006)
MIN	0.9536 (0.0013)	0.9586 (0.0006)	0.9601 (0.0011)	0.9632 (0.0006)	0.9654 (0.0003)	0.9666 (0.0005)
ABD	0.9573 (0.0005)	0.9603 (0.0006)	0.9631 (0.0010)	0.9667 (0.0008)	0.9685 (0.0003)	0.9700 (0.0006)
BNS	0.9585 (0.0003)	0.9611 (0.0006)	0.9642 (0.0010)	0.9677 (0.0009)	0.9697 (0.0003)	0.9712 (0.0007)
CPR	0.9589 (0.0003)	0.9614 (0.0007)	0.9644 (0.0011)	0.9681 (0.0008)	0.9697 (0.0003)	0.9711 (0.0006)
RATIO	0.8986 (0.0078)	0.8675 (0.0027)	0.8634 (0.0009)	0.8697 (0.0021)	0.8774 (0.0018)	0.8850 (0.0029)
LOG	0.8986 (0.0078)	0.8674 (0.0027)	0.8633 (0.0009)	0.8697 (0.0021)	0.8773 (0.0018)	0.8850 (0.0029)
DIFF	0.8679 (0.0080)	0.8393 (0.0014)	0.8416 (0.0030)	0.8544 (0.0032)	0.8651 (0.0028)	0.8773 (0.0046)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_V stressed five times per parameter category.

B.2 Jump volatility parameter: σ_S

Table 18 Jump detection test performances when σ_S is stressed under the Bates model at the 30-second sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9952 (0.0010)	0.9950 (0.0003)	0.9955 (0.0005)	0.9967 (0.0002)	0.9973 (0.0001)
MED-RATIO	0.9894 (0.0015)	0.9951 (0.0003)	0.9944 (0.0019)	0.9827 (0.0033)	0.9712 (0.0033)
MIN-RATIO	0.9856 (0.0022)	0.9943 (0.0009)	0.9928 (0.0030)	0.9745 (0.0053)	0.9569 (0.0045)
ABD-RATIO	0.9817 (0.0022)	0.9930 (0.0014)	0.9913 (0.0041)	0.9692 (0.0062)	0.9475 (0.0062)
BNS-RATIO	0.9818 (0.0022)	0.9931 (0.0015)	0.9914 (0.0042)	0.9691 (0.0062)	0.9473 (0.0062)
CPR-RATIO	0.9759 (0.0032)	0.9918 (0.0019)	0.9881 (0.0061)	0.9565 (0.0083)	0.9269 (0.0085)
MED	0.9398 (0.0016)	0.9402 (0.0001)	0.9395 (0.0003)	0.9394 (0.0003)	0.9408 (0.0005)
MIN	0.9132 (0.0021)	0.9137 (0.0002)	0.9140 (0.0002)	0.9133 (0.0002)	0.9142 (0.0004)
ABD	0.8923 (0.0016)	0.8931 (0.0001)	0.8929 (0.0002)	0.8930 (0.0002)	0.8941 (0.0006)
BNS	0.8916 (0.0016)	0.8929 (0.0002)	0.8927 (0.0002)	0.8924 (0.0002)	0.8934 (0.0006)
CPR	0.8547 (0.0013)	0.8545 (0.0004)	0.8550 (0.0006)	0.8548 (0.0004)	0.8559 (0.0004)
RATIO	0.6419 (0.0464)	0.8630 (0.0225)	0.7905 (0.0938)	0.4589 (0.0513)	0.2997 (0.0360)
LOG	0.6419 (0.0464)	0.8630 (0.0225)	0.7905 (0.0938)	0.4589 (0.0513)	0.2997 (0.0360)
DIFF	0.6366 (0.0456)	0.8550 (0.0220)	0.7836 (0.0929)	0.4563 (0.0505)	0.2990 (0.0355)
BMI					
LM	0.9958 (0.0018)	0.9964 (0.0003)	0.9971 (0.0003)	0.9971 (0.0002)	0.9974 (0.0002)
MED-RATIO	0.9949 (0.0029)	0.9964 (0.0002)	0.9971 (0.0004)	0.9964 (0.0005)	0.9956 (0.0005)
MIN-RATIO	0.9941 (0.0033)	0.9962 (0.0003)	0.9968 (0.0003)	0.9954 (0.0006)	0.9940 (0.0006)
ABD-RATIO	0.9941 (0.0028)	0.9963 (0.0001)	0.9969 (0.0003)	0.9949 (0.0007)	0.9932 (0.0009)
BNS-RATIO	0.9942 (0.0028)	0.9964 (0.0002)	0.9970 (0.0003)	0.9950 (0.0007)	0.9932 (0.0009)
CPR-RATIO	0.9942 (0.0024)	0.9967 (0.0003)	0.9970 (0.0004)	0.9939 (0.0009)	0.9911 (0.0012)
MED	0.9899 (0.0030)	0.9909 (0.0002)	0.9916 (0.0005)	0.9920 (0.0003)	0.9925 (0.0001)
MIN	0.9865 (0.0034)	0.9879 (0.0003)	0.9886 (0.0004)	0.9889 (0.0004)	0.9894 (0.0002)
ABD	0.9845 (0.0029)	0.9856 (0.0002)	0.9862 (0.0004)	0.9864 (0.0003)	0.9871 (0.0001)
BNS	0.9845 (0.0028)	0.9856 (0.0002)	0.9862 (0.0004)	0.9864 (0.0003)	0.9871 (0.0002)
CPR	0.9801 (0.0024)	0.9810 (0.0003)	0.9816 (0.0005)	0.9818 (0.0003)	0.9823 (0.0001)
RATIO	0.9255 (0.0154)	0.9822 (0.0032)	0.9676 (0.0222)	0.8274 (0.0418)	0.6472 (0.0588)
LOG	0.9255 (0.0154)	0.9822 (0.0032)	0.9676 (0.0222)	0.8274 (0.0418)	0.6472 (0.0588)
DIFF	0.9241 (0.0154)	0.9811 (0.0032)	0.9664 (0.0223)	0.8260 (0.0415)	0.6467 (0.0581)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_S stressed five times per parameter category.

Table 19 Jump detection test performances when σ_S is stressed under the Bates model at the 1-minute sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9939 (0.0015)	0.9937 (0.0003)	0.9945 (0.0006)	0.9956 (0.0002)	0.9962 (0.0001)
MED-RATIO	0.9865 (0.0019)	0.9933 (0.0005)	0.9913 (0.0028)	0.9775 (0.0031)	0.9648 (0.0036)
MIN-RATIO	0.9832 (0.0023)	0.9921 (0.0009)	0.9899 (0.0037)	0.9727 (0.0041)	0.9580 (0.0045)
ABD-RATIO	0.9771 (0.0030)	0.9904 (0.0013)	0.9870 (0.0051)	0.9642 (0.0054)	0.9441 (0.0057)
BNS-RATIO	0.9769 (0.0031)	0.9904 (0.0013)	0.9870 (0.0052)	0.9638 (0.0054)	0.9437 (0.0057)
CPR-RATIO	0.9709 (0.0039)	0.9879 (0.0017)	0.9828 (0.0066)	0.9529 (0.0071)	0.9278 (0.0071)
MED	0.9308 (0.0021)	0.9317 (0.0002)	0.9320 (0.0005)	0.9328 (0.0005)	0.9341 (0.0006)
MIN	0.9165 (0.0024)	0.9176 (0.0004)	0.9185 (0.0003)	0.9194 (0.0005)	0.9215 (0.0005)
ABD	0.8908 (0.0022)	0.8922 (0.0003)	0.8937 (0.0004)	0.8954 (0.0006)	0.8968 (0.0007)
BNS	0.8898 (0.0021)	0.8914 (0.0004)	0.8926 (0.0004)	0.8944 (0.0009)	0.8960 (0.0006)
CPR	0.8615 (0.0019)	0.8625 (0.0002)	0.8624 (0.0007)	0.8652 (0.0006)	0.8674 (0.0009)
RATIO	0.6360 (0.0451)	0.8500 (0.0222)	0.7769 (0.0917)	0.4551 (0.0495)	0.2992 (0.0355)
LOG	0.6360 (0.0451)	0.8500 (0.0222)	0.7769 (0.0917)	0.4551 (0.0495)	0.2992 (0.0355)
DIFF	0.6259 (0.0442)	0.8354 (0.0216)	0.7632 (0.0898)	0.4501 (0.0481)	0.2981 (0.0347)
BMI					
LM	0.9933 (0.0027)	0.9944 (0.0003)	0.9953 (0.0005)	0.9952 (0.0003)	0.9956 (0.0003)
MED-RATIO	0.9932 (0.0037)	0.9955 (0.0004)	0.9960 (0.0005)	0.9952 (0.0004)	0.9944 (0.0005)
MIN-RATIO	0.9927 (0.0041)	0.9952 (0.0005)	0.9956 (0.0006)	0.9947 (0.0005)	0.9935 (0.0006)
ABD-RATIO	0.9926 (0.0037)	0.9954 (0.0005)	0.9957 (0.0005)	0.9941 (0.0006)	0.9924 (0.0007)
BNS-RATIO	0.9927 (0.0037)	0.9956 (0.0005)	0.9959 (0.0005)	0.9942 (0.0006)	0.9925 (0.0008)
CPR-RATIO	0.9925 (0.0034)	0.9956 (0.0005)	0.9958 (0.0006)	0.9934 (0.0008)	0.9910 (0.0010)
MED	0.9877 (0.0036)	0.9894 (0.0004)	0.9900 (0.0006)	0.9906 (0.0003)	0.9912 (0.0002)
MIN	0.9859 (0.0041)	0.9875 (0.0005)	0.9883 (0.0007)	0.9891 (0.0003)	0.9897 (0.0002)
ABD	0.9833 (0.0036)	0.9848 (0.0005)	0.9857 (0.0004)	0.9864 (0.0004)	0.9870 (0.0001)
BNS	0.9833 (0.0036)	0.9849 (0.0005)	0.9857 (0.0005)	0.9865 (0.0003)	0.9871 (0.0001)
CPR	0.9800 (0.0033)	0.9814 (0.0004)	0.9821 (0.0005)	0.9831 (0.0002)	0.9837 (0.0002)
RATIO	0.9228 (0.0152)	0.9798 (0.0033)	0.9648 (0.0224)	0.8256 (0.0410)	0.6479 (0.0580)
LOG	0.9228 (0.0152)	0.9798 (0.0033)	0.9649 (0.0224)	0.8256 (0.0410)	0.6479 (0.0580)
DIFF	0.9200 (0.0153)	0.9777 (0.0034)	0.9624 (0.0228)	0.8230 (0.0406)	0.6472 (0.0571)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_S stressed five times per parameter category.

Table 20 Jump detection test performances when σ_S is stressed under the Bates model at the 5-minute sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9886 (0.0031)	0.9884 (0.0004)	0.9895 (0.0012)	0.9927 (0.0004)	0.9938 (0.0001)
MED-RATIO	0.9677 (0.0037)	0.9779 (0.0007)	0.9748 (0.0037)	0.9605 (0.0034)	0.9515 (0.0016)
MIN-RATIO	0.9731 (0.0041)	0.9827 (0.0010)	0.9810 (0.0037)	0.9677 (0.0022)	0.9596 (0.0015)
ABD-RATIO	0.9558 (0.0044)	0.9716 (0.0021)	0.9668 (0.0073)	0.9402 (0.0040)	0.9267 (0.0025)
BNS-RATIO	0.9554 (0.0042)	0.9713 (0.0021)	0.9666 (0.0072)	0.9397 (0.0043)	0.9257 (0.0027)
CPR-RATIO	0.9489 (0.0042)	0.9662 (0.0024)	0.9607 (0.0081)	0.9308 (0.0051)	0.9157 (0.0025)
MED	0.9137 (0.0037)	0.9154 (0.0006)	0.9177 (0.0015)	0.9223 (0.0011)	0.9279 (0.0018)
MIN	0.9274 (0.0045)	0.9296 (0.0007)	0.9306 (0.0006)	0.9330 (0.0017)	0.9387 (0.0015)
ABD	0.8763 (0.0040)	0.8769 (0.0007)	0.8772 (0.0005)	0.8820 (0.0021)	0.8898 (0.0031)
BNS	0.8755 (0.0035)	0.8755 (0.0008)	0.8758 (0.0005)	0.8804 (0.0019)	0.8886 (0.0031)
CPR	0.8617 (0.0031)	0.8612 (0.0005)	0.8618 (0.0005)	0.8662 (0.0017)	0.8752 (0.0038)
RATIO	0.5909 (0.0366)	0.7720 (0.0200)	0.7090 (0.0759)	0.4453 (0.0415)	0.3128 (0.0309)
LOG	0.5908 (0.0367)	0.7720 (0.0200)	0.7091 (0.0759)	0.4454 (0.0415)	0.3128 (0.0309)
DIFF	0.5574 (0.0328)	0.7195 (0.0188)	0.6628 (0.0681)	0.4274 (0.0368)	0.3103 (0.0272)
BMI					
LM	0.9855 (0.0059)	0.9875 (0.0008)	0.9891 (0.0007)	0.9895 (0.0005)	0.9903 (0.0004)
MED-RATIO	0.9870 (0.0064)	0.9903 (0.0008)	0.9914 (0.0008)	0.9909 (0.0005)	0.9904 (0.0004)
MIN-RATIO	0.9864 (0.0076)	0.9901 (0.0009)	0.9919 (0.0007)	0.9915 (0.0007)	0.9909 (0.0004)
ABD-RATIO	0.9860 (0.0065)	0.9904 (0.0007)	0.9911 (0.0007)	0.9896 (0.0006)	0.9881 (0.0004)
BNS-RATIO	0.9865 (0.0063)	0.9908 (0.0007)	0.9917 (0.0006)	0.9899 (0.0006)	0.9885 (0.0003)
CPR-RATIO	0.9868 (0.0055)	0.9906 (0.0008)	0.9914 (0.0008)	0.9893 (0.0007)	0.9878 (0.0005)
MED	0.9815 (0.0064)	0.9837 (0.0008)	0.9854 (0.0011)	0.9868 (0.0004)	0.9879 (0.0001)
MIN	0.9818 (0.0077)	0.9847 (0.0009)	0.9868 (0.0010)	0.9879 (0.0006)	0.9887 (0.0003)
ABD	0.9771 (0.0065)	0.9798 (0.0006)	0.9811 (0.0010)	0.9828 (0.0005)	0.9838 (0.0004)
BNS	0.9775 (0.0063)	0.9800 (0.0006)	0.9815 (0.0009)	0.9830 (0.0005)	0.9841 (0.0004)
CPR	0.9768 (0.0055)	0.9785 (0.0006)	0.9800 (0.0008)	0.9815 (0.0004)	0.9828 (0.0003)
RATIO	0.9072 (0.0140)	0.9649 (0.0041)	0.9493 (0.0219)	0.8240 (0.0349)	0.6767 (0.0474)
LOG	0.9072 (0.0140)	0.9649 (0.0041)	0.9493 (0.0219)	0.8241 (0.0349)	0.6767 (0.0474)
DIFF	0.8952 (0.0142)	0.9544 (0.0046)	0.9379 (0.0230)	0.8134 (0.0330)	0.6786 (0.0419)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_S stressed five times per parameter category.

Table 21 Jump detection test performances when σ_S is stressed under the Bates model at the 15-minute sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9816 (0.0056)	0.9804 (0.0009)	0.9828 (0.0023)	0.9875 (0.0004)	0.9889 (0.0002)
MED-RATIO	0.9387 (0.0056)	0.9492 (0.0011)	0.9474 (0.0031)	0.9387 (0.0010)	0.9398 (0.0012)
MIN-RATIO	0.9642 (0.0079)	0.9709 (0.0011)	0.9709 (0.0010)	0.9688 (0.0006)	0.9688 (0.0006)
ABD-RATIO	0.9225 (0.0064)	0.9372 (0.0017)	0.9344 (0.0048)	0.9178 (0.0017)	0.9173 (0.0019)
BNS-RATIO	0.9203 (0.0064)	0.9360 (0.0017)	0.9334 (0.0051)	0.9161 (0.0018)	0.9151 (0.0017)
CPR-RATIO	0.9207 (0.0063)	0.9349 (0.0018)	0.9321 (0.0048)	0.9157 (0.0014)	0.9156 (0.0022)
MED	0.8995 (0.0063)	0.8997 (0.0007)	0.9006 (0.0008)	0.9100 (0.0033)	0.9241 (0.0039)
MIN	0.9419 (0.0082)	0.9437 (0.0009)	0.9462 (0.0013)	0.9533 (0.0010)	0.9604 (0.0025)
ABD	0.8637 (0.0066)	0.8636 (0.0009)	0.8653 (0.0022)	0.8755 (0.0033)	0.8929 (0.0062)
BNS	0.8602 (0.0068)	0.8600 (0.0010)	0.8621 (0.0025)	0.8734 (0.0028)	0.8901 (0.0061)
CPR	0.8614 (0.0065)	0.8606 (0.0008)	0.8624 (0.0021)	0.8731 (0.0036)	0.8910 (0.0066)
RATIO	0.5414 (0.0217)	0.6536 (0.0133)	0.6125 (0.0484)	0.4550 (0.0227)	0.3886 (0.0135)
LOG	0.5413 (0.0217)	0.6535 (0.0134)	0.6126 (0.0483)	0.4552 (0.0227)	0.3888 (0.0134)
DIFF	0.4799 (0.0171)	0.5725 (0.0117)	0.5383 (0.0404)	0.4106 (0.0178)	0.3603 (0.0090)
BMI					
LM	0.9733 (0.0107)	0.9768 (0.0014)	0.9797 (0.0011)	0.9804 (0.0006)	0.9807 (0.0005)
MED-RATIO	0.9763 (0.0106)	0.9812 (0.0014)	0.9835 (0.0009)	0.9840 (0.0006)	0.9840 (0.0003)
MIN-RATIO	0.9701 (0.0142)	0.9760 (0.0014)	0.9791 (0.0016)	0.9826 (0.0003)	0.9833 (0.0002)
ABD-RATIO	0.9751 (0.0107)	0.9808 (0.0017)	0.9829 (0.0006)	0.9828 (0.0006)	0.9825 (0.0003)
BNS-RATIO	0.9762 (0.0106)	0.9823 (0.0017)	0.9847 (0.0006)	0.9843 (0.0007)	0.9840 (0.0005)
CPR-RATIO	0.9761 (0.0104)	0.9816 (0.0017)	0.9834 (0.0006)	0.9833 (0.0005)	0.9830 (0.0003)
MED	0.9720 (0.0105)	0.9759 (0.0013)	0.9786 (0.0012)	0.9810 (0.0004)	0.9824 (0.0003)
MIN	0.9681 (0.0141)	0.9735 (0.0014)	0.9768 (0.0018)	0.9812 (0.0003)	0.9825 (0.0002)
ABD	0.9682 (0.0107)	0.9723 (0.0015)	0.9749 (0.0012)	0.9778 (0.0003)	0.9796 (0.0005)
BNS	0.9691 (0.0105)	0.9734 (0.0016)	0.9763 (0.0012)	0.9792 (0.0003)	0.9810 (0.0005)
CPR	0.9692 (0.0103)	0.9729 (0.0016)	0.9753 (0.0013)	0.9782 (0.0003)	0.9800 (0.0005)
RATIO	0.8892 (0.0106)	0.9353 (0.0045)	0.9222 (0.0181)	0.8441 (0.0164)	0.7902 (0.0131)
LOG	0.8891 (0.0106)	0.9353 (0.0045)	0.9222 (0.0181)	0.8442 (0.0164)	0.7904 (0.0130)
DIFF	0.8577 (0.0108)	0.9083 (0.0054)	0.8929 (0.0205)	0.8103 (0.0160)	0.7613 (0.0100)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\mu_S = -0.1391$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with σ_S stressed five times per parameter category.

B.3 Jump mean parameter: μ_S

Table 22 Jump detection test performances when μ_S is stressed under the Bates model at the 30-second sampling frequency.

	μ_S						
	[-2, -0.75)	**[-0.75, -0.3)**	**[-0.3, 0.25)**	**[0.25, 0.9)**	**[0.9, 1.3)**	**[1.3, 1.8)**	**[1.8, 2]**
MCC							
LM	0.9982 (0.0001)	0.9980 (0.0000)	0.9948 (0.0018)	0.9980 (0.0009)	0.9991 (0.0001)	0.9992 (0.0000)	0.9992 (0.0000)
MED-RATIO	0.9541 (0.0005)	0.9636 (0.0050)	0.9859 (0.0045)	0.9599 (0.0097)	0.9740 (0.0078)	0.9951 (0.0031)	0.9998 (0.0002)
MIN-RATIO	0.9301 (0.0008)	0.9460 (0.0075)	0.9811 (0.0075)	0.9417 (0.0131)	0.9590 (0.0113)	0.9920 (0.0052)	0.9996 (0.0002)
ABD-RATIO	0.9121 (0.0007)	0.9313 (0.0093)	0.9768 (0.0104)	0.9280 (0.0166)	0.9509 (0.0139)	0.9906 (0.0067)	0.9995 (0.0002)
BNS-RATIO	0.9114 (0.0010)	0.9307 (0.0096)	0.9768 (0.0106)	0.9274 (0.0168)	0.9505 (0.0141)	0.9907 (0.0066)	0.9995 (0.0002)
CPR-RATIO	0.8790 (0.0013)	0.9042 (0.0124)	0.9693 (0.0157)	0.8997 (0.0232)	0.9305 (0.0188)	0.9868 (0.0092)	0.9994 (0.0002)
MED	0.9490 (0.0016)	0.9435 (0.0007)	0.9382 (0.0025)	0.9446 (0.0049)	0.9740 (0.0078)	0.9951 (0.0031)	0.9998 (0.0002)
MIN	0.9231 (0.0021)	0.9175 (0.0004)	0.9116 (0.0024)	0.9201 (0.0075)	0.9590 (0.0114)	0.9920 (0.0052)	0.9996 (0.0002)
ABD	0.9043 (0.0024)	0.8970 (0.0006)	0.8913 (0.0025)	0.9015 (0.0084)	0.9508 (0.0140)	0.9906 (0.0067)	0.9995 (0.0002)
BNS	0.9036 (0.0024)	0.8963 (0.0005)	0.8908 (0.0024)	0.9006 (0.0084)	0.9504 (0.0142)	0.9907 (0.0066)	0.9995 (0.0002)
CPR	0.8688 (0.0029)	0.8586 (0.0008)	0.8536 (0.0021)	0.8643 (0.0109)	0.9304 (0.0190)	0.9868 (0.0092)	0.9994 (0.0002)
RATIO	0.0788 (0.0172)	0.2053 (0.0466)	0.6036 (0.1673)	0.1696 (0.1212)	0.0183 (0.0024)	-	-
LOG	0.0788 (0.0172)	0.2053 (0.0466)	0.6036 (0.1673)	0.1696 (0.1212)	0.0183 (0.0024)	-	-
DIFF	0.0794 (0.0172)	0.2056 (0.0464)	0.5988 (0.1649)	0.1698 (0.1206)	0.0183 (0.0024)	-	-
BMI							
LM	0.9985 (0.0000)	0.9985 (0.0000)	0.9945 (0.0026)	0.9979 (0.0009)	0.9985 (0.0000)	0.9985 (0.0000)	0.9985 (0.0000)
MED-RATIO	0.9954 (0.0000)	0.9963 (0.0005)	0.9925 (0.0032)	0.9953 (0.0004)	0.9974 (0.0008)	0.9995 (0.0003)	0.9999 (0.0000)
MIN-RATIO	0.9929 (0.0001)	0.9946 (0.0007)	0.9915 (0.0032)	0.9933 (0.0004)	0.9960 (0.0012)	0.9993 (0.0005)	1.0000 (0.0000)
ABD-RATIO	0.9907 (0.0001)	0.9929 (0.0010)	0.9918 (0.0026)	0.9918 (0.0007)	0.9950 (0.0015)	0.9991 (0.0006)	0.9999 (0.0000)
BNS-RATIO	0.9907 (0.0001)	0.9929 (0.0010)	0.9919 (0.0025)	0.9918 (0.0007)	0.9951 (0.0015)	0.9991 (0.0006)	1.0000 (0.0000)
CPR-RATIO	0.9866 (0.0002)	0.9898 (0.0014)	0.9918 (0.0016)	0.9885 (0.0017)	0.9928 (0.0021)	0.9987 (0.0009)	1.0000 (0.0000)
MED	0.9948 (0.0002)	0.9943 (0.0001)	0.9877 (0.0038)	0.9937 (0.0016)	0.9974 (0.0008)	0.9995 (0.0003)	0.9999 (0.0000)
MIN	0.9921 (0.0002)	0.9914 (0.0001)	0.9843 (0.0040)	0.9909 (0.0020)	0.9960 (0.0012)	0.9993 (0.0005)	1.0000 (0.0000)
ABD	0.9897 (0.0003)	0.9888 (0.0001)	0.9826 (0.0038)	0.9887 (0.0021)	0.9950 (0.0015)	0.9991 (0.0006)	0.9999 (0.0000)
BNS	0.9897 (0.0003)	0.9888 (0.0001)	0.9826 (0.0037)	0.9887 (0.0021)	0.9950 (0.0015)	0.9991 (0.0006)	1.0000 (0.0000)
CPR	0.9853 (0.0004)	0.9839 (0.0002)	0.9784 (0.0032)	0.9840 (0.0023)	0.9928 (0.0021)	0.9987 (0.0009)	1.0000 (0.0000)
RATIO	0.1300 (0.0463)	0.4559 (0.1012)	0.8878 (0.0883)	0.3465 (0.2726)	0.0012 (0.0014)	0.0000 (0.0000)	0.0000 (0.0000)
LOG	0.1300 (0.0463)	0.4559 (0.1012)	0.8878 (0.0883)	0.3465 (0.2726)	0.0012 (0.0014)	0.0000 (0.0000)	0.0000 (0.0000)
DIFF	0.1317 (0.0464)	0.4569 (0.1008)	0.8866 (0.0882)	0.3475 (0.2718)	0.0012 (0.0015)	0.0000 (0.0000)	0.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with μ_S stressed five times per parameter category.

Table 23 Jump detection test performances when μ_S is stressed under the Bates model at the 1-minute sampling frequency.

	μ_S						
	[-2, -0.75)	**[-0.75, -0.3)**	**[-0.3, 0.25)**	**[0.25, 0.9)**	**[0.9, 1.3)**	**[1.3, 1.8)**	**[1.8, 2]**
MCC							
LM	0.9975 (0.0001)	0.9970 (0.0001)	0.9932 (0.0022)	0.9971 (0.0011)	0.9983 (0.0000)	0.9985 (0.0001)	0.9985 (0.0000)
MED-RATIO	0.9536 (0.0006)	0.9601 (0.0038)	0.9816 (0.0060)	0.9579 (0.0078)	0.9839 (0.0068)	0.9983 (0.0013)	0.9998 (0.0000)
MIN-RATIO	0.9416 (0.0013)	0.9485 (0.0053)	0.9778 (0.0071)	0.9481 (0.0094)	0.9779 (0.0084)	0.9973 (0.0022)	0.9999 (0.0000)
ABD-RATIO	0.9236 (0.0024)	0.9300 (0.0069)	0.9709 (0.0115)	0.9311 (0.0127)	0.9691 (0.0116)	0.9965 (0.0030)	0.9999 (0.0000)
BNS-RATIO	0.9230 (0.0023)	0.9296 (0.0067)	0.9707 (0.0117)	0.9307 (0.0125)	0.9690 (0.0118)	0.9966 (0.0031)	1.0000 (0.0000)
CPR-RATIO	0.9007 (0.0023)	0.9096 (0.0098)	0.9638 (0.0157)	0.9108 (0.0164)	0.9605 (0.0149)	0.9956 (0.0038)	1.0000 (0.0000)
MED	0.9482 (0.0026)	0.9391 (0.0017)	0.9299 (0.0030)	0.9431 (0.0104)	0.9838 (0.0069)	0.9983 (0.0013)	0.9998 (0.0000)
MIN	0.9359 (0.0035)	0.9242 (0.0020)	0.9151 (0.0036)	0.9302 (0.0111)	0.9778 (0.0085)	0.9973 (0.0022)	0.9999 (0.0000)
ABD	0.9162 (0.0050)	0.8989 (0.0026)	0.8899 (0.0023)	0.9076 (0.0137)	0.9691 (0.0116)	0.9965 (0.0030)	0.9999 (0.0000)
BNS	0.9154 (0.0049)	0.8984 (0.0025)	0.8889 (0.0025)	0.9071 (0.0139)	0.9690 (0.0118)	0.9966 (0.0031)	1.0000 (0.0000)
CPR	0.8919 (0.0055)	0.8706 (0.0027)	0.8608 (0.0030)	0.8808 (0.0173)	0.9604 (0.0149)	0.9956 (0.0038)	1.0000 (0.0000)
RATIO	0.0809 (0.0171)	0.2069 (0.0467)	0.5967 (0.1622)	0.1708 (0.1201)	0.0182 (0.0034)	-	-
LOG	0.0809 (0.0171)	0.2069 (0.0467)	0.5967 (0.1622)	0.1708 (0.1201)	0.0182 (0.0034)	-	-
DIFF	0.0821 (0.0172)	0.2072 (0.0459)	0.5879 (0.1576)	0.1711 (0.1187)	0.0186 (0.0032)	-	-
BMI							
LM	0.9971 (0.0000)	0.9971 (0.0001)	0.9917 (0.0033)	0.9963 (0.0013)	0.9971 (0.0000)	0.9971 (0.0000)	0.9971 (0.0000)
MED-RATIO	0.9951 (0.0001)	0.9957 (0.0003)	0.9905 (0.0040)	0.9947 (0.0008)	0.9981 (0.0007)	0.9994 (0.0001)	0.9996 (0.0000)
MIN-RATIO	0.9940 (0.0001)	0.9947 (0.0005)	0.9892 (0.0047)	0.9937 (0.0009)	0.9977 (0.0008)	0.9995 (0.0002)	0.9998 (0.0000)
ABD-RATIO	0.9920 (0.0003)	0.9927 (0.0007)	0.9897 (0.0036)	0.9920 (0.0006)	0.9968 (0.0012)	0.9995 (0.0003)	0.9998 (0.0000)
BNS-RATIO	0.9921 (0.0002)	0.9929 (0.0007)	0.9898 (0.0036)	0.9921 (0.0006)	0.9969 (0.0012)	0.9997 (0.0003)	1.0000 (0.0000)
CPR-RATIO	0.9894 (0.0002)	0.9905 (0.0011)	0.9900 (0.0025)	0.9898 (0.0009)	0.9960 (0.0016)	0.9996 (0.0004)	1.0000 (0.0000)
MED	0.9945 (0.0003)	0.9935 (0.0002)	0.9853 (0.0047)	0.9931 (0.0023)	0.9981 (0.0007)	0.9994 (0.0001)	0.9996 (0.0000)
MIN	0.9934 (0.0004)	0.9921 (0.0003)	0.9828 (0.0055)	0.9918 (0.0026)	0.9977 (0.0008)	0.9995 (0.0002)	0.9998 (0.0000)
ABD	0.9911 (0.0006)	0.9891 (0.0004)	0.9810 (0.0047)	0.9892 (0.0027)	0.9968 (0.0012)	0.9995 (0.0003)	0.9998 (0.0000)
BNS	0.9912 (0.0006)	0.9892 (0.0003)	0.9810 (0.0047)	0.9893 (0.0027)	0.9969 (0.0012)	0.9997 (0.0003)	1.0000 (0.0000)
CPR	0.9883 (0.0007)	0.9856 (0.0004)	0.9783 (0.0041)	0.9861 (0.0031)	0.9960 (0.0016)	0.9996 (0.0004)	1.0000 (0.0000)
RATIO	0.1354 (0.0463)	0.4602 (0.1008)	0.8852 (0.0866)	0.3504 (0.2708)	0.0014 (0.0017)	0.0000 (0.0000)	0.0000 (0.0000)
LOG	0.1354 (0.0463)	0.4602 (0.1008)	0.8852 (0.0866)	0.3504 (0.2708)	0.0014 (0.0017)	0.0000 (0.0000)	0.0000 (0.0000)
DIFF	0.1387 (0.0466)	0.4618 (0.0993)	0.8828 (0.0862)	0.3524 (0.2690)	0.0016 (0.0019)	0.0000 (0.0000)	0.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with μ_S stressed five times per parameter category.

Table 24 Jump detection test performances when μ_S is stressed under the Bates model at the 5-minute sampling frequency.

	μ_S						
	[-2, -0.75)	**[-0.75, -0.3)**	**[-0.3, 0.25)**	**[0.25, 0.9)**	**[0.9, 1.3)**	**[1.3, 1.8)**	**[1.8, 2]**
MCC							
LM	0.9963 (0.0002)	0.9951 (0.0004)	0.9866 (0.0046)	0.9952 (0.0020)	0.9968 (0.0000)	0.9968 (0.0000)	0.9968 (0.0000)
MED-RATIO	0.9697 (0.0049)	0.9526 (0.0014)	0.9624 (0.0044)	0.9602 (0.0133)	0.9968 (0.0021)	0.9992 (0.0000)	0.9992 (0.0000)
MIN-RATIO	0.9726 (0.0038)	0.9612 (0.0008)	0.9680 (0.0021)	0.9670 (0.0103)	0.9971 (0.0020)	0.9995 (0.0000)	0.9995 (0.0000)
ABD-RATIO	0.9471 (0.0066)	0.9258 (0.0015)	0.9477 (0.0097)	0.9367 (0.0187)	0.9951 (0.0037)	0.9995 (0.0000)	0.9995 (0.0000)
BNS-RATIO	0.9466 (0.0068)	0.9245 (0.0015)	0.9472 (0.0100)	0.9356 (0.0192)	0.9954 (0.0037)	0.9998 (0.0000)	0.9997 (0.0000)
CPR-RATIO	0.9402 (0.0080)	0.9150 (0.0019)	0.9410 (0.0113)	0.9285 (0.0217)	0.9951 (0.0040)	0.9998 (0.0000)	0.9999 (0.0000)
MED	0.9668 (0.0063)	0.9375 (0.0055)	0.9130 (0.0060)	0.9486 (0.0226)	0.9968 (0.0021)	0.9992 (0.0000)	0.9992 (0.0000)
MIN	0.9696 (0.0049)	0.9473 (0.0048)	0.9255 (0.0070)	0.9570 (0.0187)	0.9971 (0.0020)	0.9995 (0.0000)	0.9995 (0.0000)
ABD	0.9425 (0.0084)	0.9022 (0.0075)	0.8743 (0.0073)	0.9190 (0.0323)	0.9951 (0.0037)	0.9995 (0.0000)	0.9995 (0.0000)
BNS	0.9420 (0.0085)	0.9008 (0.0078)	0.8732 (0.0071)	0.9179 (0.0328)	0.9954 (0.0037)	0.9998 (0.0000)	0.9997 (0.0000)
CPR	0.9351 (0.0100)	0.8896 (0.0081)	0.8605 (0.0077)	0.9092 (0.0370)	0.9951 (0.0041)	0.9998 (0.0000)	0.9999 (0.0000)
RATIO	0.1140 (0.0169)	0.2309 (0.0417)	0.5581 (0.1310)	0.1955 (0.1095)	0.0338 (0.0069)	0.0188 (0.0020)	0.0150 (0.0002)
LOG	0.1139 (0.0169)	0.2309 (0.0417)	0.5581 (0.1310)	0.1955 (0.1095)	0.0339 (0.0069)	0.0189 (0.0020)	0.0150 (0.0003)
DIFF	0.1484 (0.0105)	0.2393 (0.0363)	0.5287 (0.1165)	0.2154 (0.0865)	0.2029 (0.0516)	0.5627 (0.1613)	0.9464 (0.0235)
BMI							
LM	0.9938 (0.0000)	0.9937 (0.0001)	0.9813 (0.0073)	0.9919 (0.0029)	0.9938 (0.0000)	0.9938 (0.0000)	0.9938 (0.0000)
MED-RATIO	0.9957 (0.0005)	0.9939 (0.0002)	0.9822 (0.0074)	0.9931 (0.0036)	0.9983 (0.0002)	0.9986 (0.0000)	0.9986 (0.0000)
MIN-RATIO	0.9965 (0.0004)	0.9952 (0.0001)	0.9808 (0.0089)	0.9938 (0.0040)	0.9988 (0.0002)	0.9990 (0.0000)	0.9990 (0.0000)
ABD-RATIO	0.9940 (0.0007)	0.9917 (0.0002)	0.9806 (0.0073)	0.9912 (0.0040)	0.9988 (0.0003)	0.9992 (0.0001)	0.9991 (0.0000)
BNS-RATIO	0.9944 (0.0007)	0.9919 (0.0002)	0.9811 (0.0072)	0.9914 (0.0041)	0.9993 (0.0003)	0.9996 (0.0001)	0.9995 (0.0000)
CPR-RATIO	0.9937 (0.0009)	0.9909 (0.0002)	0.9818 (0.0063)	0.9908 (0.0041)	0.9994 (0.0004)	0.9998 (0.0000)	0.9997 (0.0000)
MED	0.9954 (0.0007)	0.9923 (0.0006)	0.9772 (0.0082)	0.9918 (0.0048)	0.9983 (0.0002)	0.9986 (0.0000)	0.9986 (0.0000)
MIN	0.9961 (0.0005)	0.9938 (0.0006)	0.9766 (0.0096)	0.9928 (0.0050)	0.9988 (0.0002)	0.9990 (0.0000)	0.9990 (0.0000)
ABD	0.9934 (0.0009)	0.9889 (0.0009)	0.9723 (0.0090)	0.9891 (0.0060)	0.9988 (0.0003)	0.9992 (0.0001)	0.9991 (0.0000)
BNS	0.9938 (0.0009)	0.9891 (0.0010)	0.9728 (0.0089)	0.9893 (0.0061)	0.9993 (0.0003)	0.9996 (0.0001)	0.9995 (0.0000)
CPR	0.9931 (0.0011)	0.9878 (0.0011)	0.9726 (0.0081)	0.9885 (0.0064)	0.9994 (0.0004)	0.9998 (0.0000)	0.9997 (0.0000)
RATIO	0.2245 (0.0483)	0.5217 (0.0838)	0.8739 (0.0727)	0.4145 (0.2450)	0.0267 (0.0114)	0.0050 (0.0025)	0.0007 (0.0002)
LOG	0.2243 (0.0483)	0.5215 (0.0838)	0.8739 (0.0727)	0.4147 (0.2449)	0.0268 (0.0114)	0.0051 (0.0025)	0.0007 (0.0002)
DIFF	0.3260 (0.0298)	0.5473 (0.0707)	0.8639 (0.0704)	0.4754 (0.1826)	0.4465 (0.1040)	0.8421 (0.0903)	0.9917 (0.0042)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with μ_S stressed five times per parameter category.

Table 25 Jump detection test performances when μ_S is stressed under the Bates model at the 15-minute sampling frequency.

	μ_S						
	[-2, -0.75)	**[-0.75, -0.3)**	**[-0.3, 0.25)**	**[0.25, 0.9)**	**[0.9, 1.3)**	**[1.3, 1.8)**	**[1.8, 2]**
MCC							
LM	0.9939 (0.0001)	0.9930 (0.0005)	0.9783 (0.0077)	0.9919 (0.0032)	0.9940 (0.0000)	0.9940 (0.0000)	0.9940 (0.0000)
MED-RATIO	0.9801 (0.0056)	0.9534 (0.0054)	0.9345 (0.0041)	0.9629 (0.0221)	0.9976 (0.0004)	0.9979 (0.0000)	0.9979 (0.0000)
MIN-RATIO	0.9896 (0.0030)	0.9758 (0.0027)	0.9580 (0.0070)	0.9809 (0.0120)	0.9986 (0.0003)	0.9989 (0.0000)	0.9989 (0.0000)
ABD-RATIO	0.9705 (0.0076)	0.9311 (0.0072)	0.9164 (0.0014)	0.9457 (0.0291)	0.9970 (0.0009)	0.9980 (0.0000)	0.9980 (0.0000)
BNS-RATIO	0.9699 (0.0077)	0.9282 (0.0077)	0.9143 (0.0016)	0.9447 (0.0302)	0.9979 (0.0010)	0.9989 (0.0000)	0.9989 (0.0000)
CPR-RATIO	0.9706 (0.0078)	0.9299 (0.0075)	0.9147 (0.0012)	0.9451 (0.0300)	0.9976 (0.0009)	0.9986 (0.0000)	0.9986 (0.0000)
MED	0.9785 (0.0063)	0.9444 (0.0091)	0.8977 (0.0133)	0.9555 (0.0293)	0.9976 (0.0004)	0.9979 (0.0000)	0.9979 (0.0000)
MIN	0.9888 (0.0033)	0.9702 (0.0050)	0.9377 (0.0118)	0.9770 (0.0162)	0.9986 (0.0003)	0.9989 (0.0000)	0.9989 (0.0000)
ABD	0.9675 (0.0085)	0.9154 (0.0122)	0.8617 (0.0134)	0.9338 (0.0404)	0.9970 (0.0009)	0.9980 (0.0000)	0.9980 (0.0000)
BNS	0.9669 (0.0085)	0.9126 (0.0128)	0.8586 (0.0137)	0.9325 (0.0418)	0.9979 (0.0010)	0.9989 (0.0000)	0.9989 (0.0000)
CPR	0.9677 (0.0087)	0.9142 (0.0126)	0.8596 (0.0135)	0.9331 (0.0413)	0.9976 (0.0009)	0.9986 (0.0000)	0.9986 (0.0000)
RATIO	0.4069 (0.0206)	0.3696 (0.0101)	0.5211 (0.0729)	0.4020 (0.0606)	0.8163 (0.0920)	0.9918 (0.0097)	1.0000 (0.0000)
LOG	0.4065 (0.0205)	0.3694 (0.0102)	0.5210 (0.0729)	0.4024 (0.0607)	0.8171 (0.0918)	0.9919 (0.0097)	1.0000 (0.0000)
DIFF	0.4214 (0.0273)	0.3536 (0.0045)	0.4638 (0.0579)	0.4004 (0.0835)	0.8663 (0.0806)	0.9969 (0.0043)	1.0000 (0.0000)
BMI							
LM	0.9884 (0.0000)	0.9882 (0.0002)	0.9669 (0.0118)	0.9851 (0.0051)	0.9884 (0.0000)	0.9884 (0.0000)	0.9884 (0.0000)
MED-RATIO	0.9944 (0.0006)	0.9916 (0.0007)	0.9688 (0.0123)	0.9897 (0.0065)	0.9960 (0.0000)	0.9960 (0.0000)	0.9960 (0.0000)
MIN-RATIO	0.9959 (0.0007)	0.9918 (0.0009)	0.9608 (0.0171)	0.9906 (0.0081)	0.9978 (0.0001)	0.9979 (0.0000)	0.9979 (0.0000)
ABD-RATIO	0.9936 (0.0008)	0.9895 (0.0007)	0.9671 (0.0125)	0.9881 (0.0072)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
BNS-RATIO	0.9952 (0.0008)	0.9908 (0.0008)	0.9686 (0.0122)	0.9897 (0.0072)	0.9979 (0.0001)	0.9980 (0.0000)	0.9980 (0.0000)
CPR-RATIO	0.9947 (0.0008)	0.9903 (0.0008)	0.9686 (0.0120)	0.9890 (0.0074)	0.9973 (0.0000)	0.9973 (0.0000)	0.9973 (0.0000)
MED	0.9942 (0.0006)	0.9906 (0.0011)	0.9651 (0.0131)	0.9890 (0.0072)	0.9960 (0.0000)	0.9960 (0.0000)	0.9960 (0.0000)
MIN	0.9958 (0.0007)	0.9913 (0.0011)	0.9590 (0.0175)	0.9902 (0.0085)	0.9978 (0.0001)	0.9979 (0.0000)	0.9979 (0.0000)
ABD	0.9933 (0.0009)	0.9876 (0.0014)	0.9609 (0.0138)	0.9866 (0.0087)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
BNS	0.9949 (0.0009)	0.9890 (0.0015)	0.9622 (0.0138)	0.9882 (0.0088)	0.9979 (0.0001)	0.9980 (0.0000)	0.9980 (0.0000)
CPR	0.9944 (0.0009)	0.9885 (0.0015)	0.9624 (0.0134)	0.9876 (0.0088)	0.9973 (0.0000)	0.9973 (0.0000)	0.9973 (0.0000)
RATIO	0.8021 (0.0165)	0.7727 (0.0103)	0.8705 (0.0341)	0.7949 (0.0435)	0.9692 (0.0194)	0.9991 (0.0010)	1.0000 (0.0000)
LOG	0.8017 (0.0164)	0.7724 (0.0103)	0.8705 (0.0342)	0.7952 (0.0435)	0.9694 (0.0193)	0.9992 (0.0010)	1.0000 (0.0000)
DIFF	0.8107 (0.0209)	0.7545 (0.0053)	0.8398 (0.0358)	0.7877 (0.0570)	0.9793 (0.0150)	0.9997 (0.0004)	1.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\lambda = 12$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with μ_S stressed five times per parameter category.

B.4 Jump intensity parameter: λ

Table 26 Jump detection test performances when λ is stressed under the Bates model at the 30-second sampling frequency.

	λ			
	[1, 1.8)	**[1.8, 5.1)**	**[5.1, 26.4)**	**[26.4, 30]**
MCC				
LM	0.9795 (0.0032)	0.9850 (0.0041)	0.9929 (0.0026)	0.9958 (0.0003)
MED-RATIO	0.9827 (0.0015)	0.9853 (0.0021)	0.9871 (0.0011)	0.9847 (0.0008)
MIN-RATIO	0.9772 (0.0016)	0.9808 (0.0027)	0.9829 (0.0013)	0.9795 (0.0006)
ABD-RATIO	0.9717 (0.0030)	0.9774 (0.0017)	0.9804 (0.0017)	0.9761 (0.0008)
BNS-RATIO	0.9718 (0.0033)	0.9773 (0.0018)	0.9804 (0.0017)	0.9760 (0.0008)
CPR-RATIO	0.9627 (0.0035)	0.9688 (0.0033)	0.9739 (0.0020)	0.9678 (0.0009)
MED	0.7476 (0.0137)	0.8041 (0.0328)	0.9234 (0.0357)	0.9685 (0.0010)
MIN	0.6741 (0.0119)	0.7464 (0.0409)	0.8952 (0.0461)	0.9559 (0.0016)
ABD	0.6227 (0.0139)	0.7014 (0.0455)	0.8735 (0.0566)	0.9470 (0.0015)
BNS	0.6203 (0.0146)	0.6999 (0.0458)	0.8726 (0.0567)	0.9466 (0.0014)
CPR	0.5466 (0.0122)	0.6326 (0.0504)	0.8326 (0.0694)	0.9268 (0.0021)
RATIO	0.5785 (0.0074)	0.6293 (0.0244)	0.6231 (0.0504)	0.4709 (0.0108)
LOG	0.5785 (0.0074)	0.6293 (0.0244)	0.6231 (0.0504)	0.4709 (0.0108)
DIFF	0.5626 (0.0093)	0.6159 (0.0265)	0.6175 (0.0480)	0.4699 (0.0107)
BMI				
LM	0.9946 (0.0013)	0.9941 (0.0016)	0.9924 (0.0014)	0.9930 (0.0006)
MED-RATIO	0.9925 (0.0025)	0.9930 (0.0023)	0.9915 (0.0014)	0.9903 (0.0006)
MIN-RATIO	0.9915 (0.0020)	0.9918 (0.0021)	0.9904 (0.0015)	0.9886 (0.0006)
ABD-RATIO	0.9930 (0.0014)	0.9929 (0.0021)	0.9911 (0.0014)	0.9887 (0.0007)
BNS-RATIO	0.9930 (0.0014)	0.9929 (0.0021)	0.9913 (0.0014)	0.9888 (0.0007)
CPR-RATIO	0.9946 (0.0010)	0.9934 (0.0018)	0.9914 (0.0015)	0.9876 (0.0008)
MED	0.9871 (0.0023)	0.9871 (0.0024)	0.9864 (0.0014)	0.9869 (0.0005)
MIN	0.9833 (0.0020)	0.9834 (0.0022)	0.9829 (0.0013)	0.9834 (0.0005)
ABD	0.9823 (0.0011)	0.9823 (0.0017)	0.9818 (0.0015)	0.9822 (0.0005)
BNS	0.9823 (0.0011)	0.9822 (0.0017)	0.9819 (0.0014)	0.9823 (0.0005)
CPR	0.9792 (0.0012)	0.9784 (0.0016)	0.9777 (0.0014)	0.9782 (0.0006)
RATIO	0.9821 (0.0017)	0.9780 (0.0030)	0.9124 (0.0585)	0.7004 (0.0193)
LOG	0.9821 (0.0017)	0.9780 (0.0030)	0.9124 (0.0585)	0.7004 (0.0193)
DIFF	0.9810 (0.0017)	0.9768 (0.0031)	0.9111 (0.0586)	0.6999 (0.0191)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with λ stressed five times per parameter category.

Table 27 Jump detection test performances when λ is stressed under the Bates model at the 1-minute sampling frequency.

	λ			
	[1, 1.8)	**[1.8, 5.1)**	**[5.1, 26.4)**	**[26.4, 30]**
MCC				
LM	0.9768 (0.0016)	0.9814 (0.0036)	0.9907 (0.0030)	0.9942 (0.0003)
MED-RATIO	0.9768 (0.0019)	0.9786 (0.0029)	0.9825 (0.0014)	0.9820 (0.0005)
MIN-RATIO	0.9713 (0.0037)	0.9747 (0.0015)	0.9790 (0.0014)	0.9786 (0.0006)
ABD-RATIO	0.9588 (0.0058)	0.9672 (0.0026)	0.9735 (0.0019)	0.9727 (0.0007)
BNS-RATIO	0.9581 (0.0058)	0.9667 (0.0026)	0.9733 (0.0018)	0.9725 (0.0006)
CPR-RATIO	0.9473 (0.0048)	0.9564 (0.0035)	0.9664 (0.0021)	0.9657 (0.0010)
MED	0.7305 (0.0111)	0.7949 (0.0323)	0.9177 (0.0363)	0.9658 (0.0011)
MIN	0.6861 (0.0091)	0.7536 (0.0376)	0.8990 (0.0434)	0.9578 (0.0018)
ABD	0.6154 (0.0112)	0.6964 (0.0416)	0.8699 (0.0552)	0.9442 (0.0018)
BNS	0.6139 (0.0108)	0.6944 (0.0422)	0.8688 (0.0555)	0.9437 (0.0018)
CPR	0.5557 (0.0112)	0.6418 (0.0450)	0.8370 (0.0659)	0.9289 (0.0024)
RATIO	0.5522 (0.0082)	0.6022 (0.0268)	0.6112 (0.0454)	0.4695 (0.0103)
LOG	0.5522 (0.0081)	0.6022 (0.0268)	0.6112 (0.0454)	0.4695 (0.0103)
DIFF	0.5260 (0.0089)	0.5791 (0.0309)	0.6010 (0.0414)	0.4677 (0.0099)
BMI				
LM	0.9919 (0.0018)	0.9912 (0.0010)	0.9897 (0.0012)	0.9900 (0.0006)
MED-RATIO	0.9913 (0.0019)	0.9912 (0.0025)	0.9894 (0.0011)	0.9881 (0.0005)
MIN-RATIO	0.9900 (0.0021)	0.9896 (0.0021)	0.9882 (0.0014)	0.9867 (0.0005)
ABD-RATIO	0.9905 (0.0023)	0.9909 (0.0023)	0.9887 (0.0013)	0.9864 (0.0006)
BNS-RATIO	0.9905 (0.0024)	0.9909 (0.0023)	0.9888 (0.0014)	0.9866 (0.0006)
CPR-RATIO	0.9915 (0.0019)	0.9919 (0.0018)	0.9889 (0.0016)	0.9859 (0.0006)
MED	0.9853 (0.0019)	0.9854 (0.0024)	0.9843 (0.0010)	0.9848 (0.0005)
MIN	0.9823 (0.0022)	0.9820 (0.0021)	0.9815 (0.0012)	0.9822 (0.0004)
ABD	0.9797 (0.0021)	0.9804 (0.0021)	0.9796 (0.0009)	0.9802 (0.0005)
BNS	0.9796 (0.0022)	0.9803 (0.0022)	0.9796 (0.0011)	0.9803 (0.0004)
CPR	0.9771 (0.0018)	0.9777 (0.0016)	0.9767 (0.0011)	0.9776 (0.0004)
RATIO	0.9778 (0.0022)	0.9744 (0.0037)	0.9082 (0.0587)	0.6996 (0.0188)
LOG	0.9778 (0.0022)	0.9744 (0.0037)	0.9082 (0.0587)	0.6996 (0.0188)
DIFF	0.9763 (0.0029)	0.9723 (0.0035)	0.9057 (0.0585)	0.6986 (0.0185)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with λ stressed five times per parameter category.

Table 28 Jump detection test performances when λ is stressed under the Bates model at the 5-minute sampling frequency.

	λ			
	[1, 1.8)	**[1.8, 5.1)**	**[5.1, 26.4)**	**[26.4, 30]**
MCC				
LM	0.9630 (0.0034)	0.9675 (0.0038)	0.9822 (0.0051)	0.9874 (0.0005)
MED-RATIO	0.9102 (0.0035)	0.9322 (0.0064)	0.9614 (0.0069)	0.9705 (0.0006)
MIN-RATIO	0.9331 (0.0054)	0.9462 (0.0067)	0.9669 (0.0037)	0.9736 (0.0005)
ABD-RATIO	0.8783 (0.0075)	0.9053 (0.0115)	0.9455 (0.0106)	0.9593 (0.0006)
BNS-RATIO	0.8763 (0.0074)	0.9037 (0.0117)	0.9450 (0.0105)	0.9595 (0.0004)
CPR-RATIO	0.8560 (0.0070)	0.8878 (0.0145)	0.9380 (0.0127)	0.9555 (0.0007)
MED	0.6832 (0.0088)	0.7550 (0.0368)	0.8989 (0.0421)	0.9569 (0.0013)
MIN	0.7172 (0.0129)	0.7849 (0.0321)	0.9103 (0.0367)	0.9612 (0.0010)
ABD	0.5863 (0.0106)	0.6715 (0.0435)	0.8509 (0.0603)	0.9368 (0.0022)
BNS	0.5818 (0.0106)	0.6674 (0.0437)	0.8489 (0.0611)	0.9367 (0.0022)
CPR	0.5536 (0.0109)	0.6420 (0.0456)	0.8353 (0.0651)	0.9303 (0.0027)
RATIO	0.4331 (0.0080)	0.4951 (0.0324)	0.5648 (0.0221)	0.4785 (0.0080)
LOG	0.4329 (0.0080)	0.4951 (0.0324)	0.5647 (0.0221)	0.4785 (0.0080)
DIFF	0.3766 (0.0082)	0.4399 (0.0338)	0.5306 (0.0193)	0.4729 (0.0065)
BMI				
LM	0.9826 (0.0029)	0.9803 (0.0018)	0.9779 (0.0016)	0.9770 (0.0011)
MED-RATIO	0.9834 (0.0024)	0.9838 (0.0033)	0.9806 (0.0022)	0.9780 (0.0009)
MIN-RATIO	0.9819 (0.0035)	0.9826 (0.0038)	0.9788 (0.0016)	0.9776 (0.0009)
ABD-RATIO	0.9830 (0.0018)	0.9822 (0.0039)	0.9787 (0.0017)	0.9761 (0.0008)
BNS-RATIO	0.9833 (0.0018)	0.9824 (0.0039)	0.9795 (0.0020)	0.9772 (0.0008)
CPR-RATIO	0.9836 (0.0018)	0.9835 (0.0034)	0.9802 (0.0020)	0.9774 (0.0008)
MED	0.9772 (0.0026)	0.9775 (0.0031)	0.9757 (0.0016)	0.9754 (0.0007)
MIN	0.9764 (0.0036)	0.9773 (0.0036)	0.9744 (0.0012)	0.9751 (0.0008)
ABD	0.9722 (0.0019)	0.9722 (0.0042)	0.9700 (0.0013)	0.9712 (0.0006)
BNS	0.9723 (0.0018)	0.9722 (0.0041)	0.9707 (0.0016)	0.9723 (0.0005)
CPR	0.9713 (0.0020)	0.9718 (0.0037)	0.9706 (0.0010)	0.9721 (0.0006)
RATIO	0.9604 (0.0016)	0.9557 (0.0046)	0.8949 (0.0526)	0.7144 (0.0158)
LOG	0.9604 (0.0016)	0.9557 (0.0046)	0.8949 (0.0526)	0.7144 (0.0158)
DIFF	0.9505 (0.0019)	0.9456 (0.0047)	0.8837 (0.0516)	0.7129 (0.0144)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with λ stressed five times per parameter category.

Table 29 Jump detection test performances when λ is stressed under the Bates model at the 15-minute sampling frequency.

	λ			
	[1, 1.8)	**[1.8, 5.1)**	**[5.1, 26.4)**	**[26.4, 30]**
MCC				
LM	0.9413 (0.0037)	0.9509 (0.0046)	0.9732 (0.0045)	0.9768 (0.0007)
MED-RATIO	0.7981 (0.0044)	0.8433 (0.0234)	0.9238 (0.0248)	0.9557 (0.0011)
MIN-RATIO	0.8999 (0.0039)	0.9188 (0.0083)	0.9514 (0.0099)	0.9642 (0.0009)
ABD-RATIO	0.7542 (0.0033)	0.8047 (0.0256)	0.9039 (0.0313)	0.9441 (0.0008)
BNS-RATIO	0.7480 (0.0040)	0.7990 (0.0262)	0.9019 (0.0327)	0.9444 (0.0009)
CPR-RATIO	0.7439 (0.0026)	0.7980 (0.0264)	0.9013 (0.0333)	0.9443 (0.0008)
MED	0.6353 (0.0107)	0.7212 (0.0406)	0.8747 (0.0528)	0.9460 (0.0020)
MIN	0.7794 (0.0088)	0.8316 (0.0262)	0.9233 (0.0280)	0.9592 (0.0012)
ABD	0.5557 (0.0101)	0.6423 (0.0472)	0.8352 (0.0664)	0.9284 (0.0021)
BNS	0.5470 (0.0100)	0.6344 (0.0482)	0.8321 (0.0680)	0.9284 (0.0024)
CPR	0.5485 (0.0089)	0.6361 (0.0479)	0.8323 (0.0682)	0.9285 (0.0021)
RATIO	0.3121 (0.0074)	0.3776 (0.0359)	0.5129 (0.0383)	0.5522 (0.0009)
LOG	0.3121 (0.0074)	0.3777 (0.0359)	0.5128 (0.0383)	0.5519 (0.0008)
DIFF	0.2545 (0.0063)	0.3138 (0.0331)	0.4538 (0.0444)	0.5156 (0.0025)
BMI				
LM	0.9681 (0.0049)	0.9671 (0.0044)	0.9617 (0.0028)	0.9563 (0.0017)
MED-RATIO	0.9712 (0.0063)	0.9703 (0.0017)	0.9652 (0.0038)	0.9602 (0.0015)
MIN-RATIO	0.9595 (0.0092)	0.9616 (0.0043)	0.9549 (0.0018)	0.9537 (0.0019)
ABD-RATIO	0.9692 (0.0056)	0.9677 (0.0021)	0.9624 (0.0029)	0.9581 (0.0016)
BNS-RATIO	0.9702 (0.0061)	0.9689 (0.0034)	0.9638 (0.0023)	0.9612 (0.0015)
CPR-RATIO	0.9696 (0.0057)	0.9684 (0.0024)	0.9635 (0.0025)	0.9603 (0.0014)
MED	0.9657 (0.0063)	0.9651 (0.0014)	0.9612 (0.0032)	0.9586 (0.0014)
MIN	0.9569 (0.0091)	0.9589 (0.0041)	0.9531 (0.0017)	0.9530 (0.0019)
ABD	0.9604 (0.0051)	0.9589 (0.0016)	0.9559 (0.0021)	0.9550 (0.0015)
BNS	0.9612 (0.0054)	0.9597 (0.0028)	0.9570 (0.0018)	0.9580 (0.0014)
CPR	0.9607 (0.0052)	0.9594 (0.0020)	0.9569 (0.0019)	0.9573 (0.0013)
RATIO	0.9266 (0.0053)	0.9222 (0.0051)	0.8781 (0.0316)	0.7949 (0.0056)
LOG	0.9265 (0.0053)	0.9223 (0.0051)	0.8781 (0.0317)	0.7948 (0.0056)
DIFF	0.9002 (0.0037)	0.8953 (0.0051)	0.8482 (0.0337)	0.7660 (0.0046)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.27$, $\sigma_S = 0.15$, $\mu_S = -0.1391$, $\kappa = 3.99$, $\theta = 0.014$, $\sqrt{V_0} = 0.094$ and $\rho = -0.79$ with λ stressed five times per parameter category.

Appendix C

SVJJ model: tabulated results

At each sampling frequency, the stress ranges of the variable parameters under the SVJJ model, which are stressed one-at-a-time, are each divided into a number of parameter categories. The categories are chosen such that every jump detection test produces similar absolute and relative performances across the parameter values within each category. Five random values from each parameter category are sampled. The average and standard deviation (in parenthesis) of these five values are tabulated below, which provide the absolute performances of the jump detection tests under the SVJJ model. The other parameters are held constant at their calibrated values presented in Table 3, subject to Section 4.2.

Additionally, heat maps for each parameter category are superimposed on the tabulated results, which provide the relative performances of the jump detection tests, per parameter category, under the SVJJ model. The relative MCC performances are displayed in green and the relative BMI performances in blue. The darker the shade, the higher the rank of the jump detection test. As the colour fades, the rank of the jump detection test declines. The absolute and relative sensitivity of each jump detection test to changes in the variable parameter values can be examined. For both the MCC and BMI, changes in the relative performances of the jump detection tests can be observed across the parameter categories (rows), as well as per parameter category (columns). Moreover, the MCC and BMI rankings of each jump detection test, for every parameter category, can be directly compared. A light green and dark blue combination implies that the jump detection test's MCC performance ranks low, while its BMI performance ranks high, over that parameter category.

C.1 Volatility-of-volatility parameter: σ_V

Table 30 Jump detection test performances when σ_V is stressed under the SVJJ model at the 30-second sampling frequency.

	σ_V				
	[0, 0.34)	**[0.34, 0.5)**	**[0.5, 0.67)**	**[0.67, 0.87)**	**[0.87, 1]**
MCC					
LM	0.9911 (0.0057)	0.9525 (0.0230)	0.8326 (0.0436)	0.6816 (0.0459)	0.5140 (0.0258)
MED-RATIO	0.9961 (0.0006)	0.9952 (0.0002)	0.9942 (0.0002)	0.9935 (0.0001)	0.9929 (0.0003)
MIN-RATIO	0.9955 (0.0007)	0.9941 (0.0001)	0.9936 (0.0002)	0.9929 (0.0001)	0.9932 (0.0002)
ABD-RATIO	0.9946 (0.0009)	0.9926 (0.0002)	0.9922 (0.0002)	0.9914 (0.0003)	0.9907 (0.0002)
BNS-RATIO	0.9946 (0.0010)	0.9925 (0.0002)	0.9918 (0.0002)	0.9908 (0.0002)	0.9898 (0.0002)
CPR-RATIO	0.9921 (0.0011)	0.9897 (0.0004)	0.9886 (0.0003)	0.9877 (0.0003)	0.9868 (0.0006)
MED	0.9398 (0.0002)	0.9402 (0.0002)	0.9397 (0.0003)	0.9414 (0.0003)	0.9426 (0.0002)
MIN	0.9162 (0.0003)	0.9162 (0.0002)	0.9172 (0.0003)	0.9188 (0.0007)	0.9215 (0.0006)
ABD	0.8969 (0.0006)	0.8961 (0.0003)	0.8979 (0.0008)	0.9004 (0.0005)	0.9019 (0.0004)
BNS	0.8963 (0.0007)	0.8954 (0.0003)	0.8970 (0.0006)	0.8992 (0.0004)	0.9002 (0.0005)
CPR	0.8601 (0.0005)	0.8593 (0.0001)	0.8601 (0.0007)	0.8629 (0.0008)	0.8656 (0.0007)
RATIO	0.8417 (0.0186)	0.7909 (0.0155)	0.7291 (0.0191)	0.6691 (0.0155)	0.6127 (0.0094)
LOG	0.8417 (0.0186)	0.7909 (0.0155)	0.7291 (0.0191)	0.6691 (0.0155)	0.6127 (0.0094)
DIFF	0.8346 (0.0182)	0.7853 (0.0152)	0.7249 (0.0184)	0.6691 (0.0138)	0.6175 (0.0088)
BMI					
LM	0.9972 (0.0000)	0.9972 (0.0000)	0.9971 (0.0000)	0.9971 (0.0000)	0.9969 (0.0000)
MED-RATIO	0.9995 (0.0001)	0.9994 (0.0000)	0.9993 (0.0001)	0.9991 (0.0000)	0.9990 (0.0000)
MIN-RATIO	0.9995 (0.0001)	0.9994 (0.0000)	0.9992 (0.0001)	0.9990 (0.0000)	0.9987 (0.0000)
ABD-RATIO	0.9995 (0.0001)	0.9993 (0.0000)	0.9993 (0.0000)	0.9992 (0.0000)	0.9991 (0.0000)
BNS-RATIO	0.9995 (0.0001)	0.9993 (0.0000)	0.9992 (0.0000)	0.9992 (0.0000)	0.9991 (0.0000)
CPR-RATIO	0.9993 (0.0001)	0.9990 (0.0000)	0.9989 (0.0000)	0.9988 (0.0000)	0.9988 (0.0000)
MED	0.9937 (0.0000)	0.9937 (0.0000)	0.9937 (0.0000)	0.9937 (0.0000)	0.9938 (0.0000)
MIN	0.9911 (0.0000)	0.9911 (0.0000)	0.9911 (0.0000)	0.9911 (0.0000)	0.9911 (0.0000)
ABD	0.9888 (0.0001)	0.9887 (0.0000)	0.9889 (0.0001)	0.9892 (0.0001)	0.9894 (0.0001)
BNS	0.9887 (0.0001)	0.9886 (0.0000)	0.9888 (0.0001)	0.9891 (0.0001)	0.9892 (0.0001)
CPR	0.9838 (0.0001)	0.9837 (0.0000)	0.9838 (0.0001)	0.9842 (0.0001)	0.9846 (0.0001)
RATIO	0.9801 (0.0043)	0.9671 (0.0044)	0.9487 (0.0059)	0.9289 (0.0056)	0.9085 (0.0035)
LOG	0.9801 (0.0043)	0.9671 (0.0044)	0.9487 (0.0059)	0.9289 (0.0056)	0.9085 (0.0035)
DIFF	0.9790 (0.0043)	0.9662 (0.0043)	0.9483 (0.0057)	0.9301 (0.0049)	0.9120 (0.0031)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_V stressed five times per parameter category.

Table 31 Jump detection test performances when σ_V is stressed under the SVJJ model at the 1-minute sampling frequency.

	σ_V				
	[0, 0.34)	**[0.34, 0.5)**	**[0.5, 0.67)**	**[0.67, 0.87)**	**[0.87, 1]**
MCC					
LM	0.9924 (0.0037)	0.9687 (0.0149)	0.8869 (0.0318)	0.7711 (0.0376)	0.6272 (0.0244)
MED-RATIO	0.9950 (0.0004)	0.9940 (0.0003)	0.9933 (0.0003)	0.9926 (0.0002)	0.9915 (0.0003)
MIN-RATIO	0.9948 (0.0007)	0.9938 (0.0002)	0.9928 (0.0004)	0.9922 (0.0002)	0.9919 (0.0001)
ABD-RATIO	0.9925 (0.0010)	0.9907 (0.0003)	0.9896 (0.0005)	0.9890 (0.0003)	0.9881 (0.0001)
BNS-RATIO	0.9924 (0.0010)	0.9907 (0.0004)	0.9894 (0.0005)	0.9886 (0.0003)	0.9877 (0.0001)
CPR-RATIO	0.9899 (0.0014)	0.9872 (0.0003)	0.9860 (0.0006)	0.9852 (0.0003)	0.9842 (0.0002)
MED	0.9400 (0.0002)	0.9402 (0.0001)	0.9409 (0.0002)	0.9410 (0.0004)	0.9423 (0.0001)
MIN	0.9229 (0.0004)	0.9231 (0.0003)	0.9236 (0.0004)	0.9245 (0.0003)	0.9269 (0.0006)
ABD	0.8956 (0.0004)	0.8962 (0.0005)	0.8978 (0.0001)	0.8997 (0.0008)	0.9020 (0.0008)
BNS	0.8947 (0.0002)	0.8954 (0.0005)	0.8963 (0.0001)	0.8979 (0.0007)	0.9005 (0.0005)
CPR	0.8674 (0.0001)	0.8676 (0.0004)	0.8695 (0.0005)	0.8721 (0.0006)	0.8744 (0.0008)
RATIO	0.8327 (0.0188)	0.7814 (0.0156)	0.7177 (0.0200)	0.6558 (0.0168)	0.5939 (0.0105)
LOG	0.8326 (0.0188)	0.7813 (0.0156)	0.7177 (0.0200)	0.6558 (0.0168)	0.5939 (0.0105)
DIFF	0.8181 (0.0177)	0.7695 (0.0149)	0.7100 (0.0181)	0.6532 (0.0154)	0.5969 (0.0094)
BMI					
LM	0.9967 (0.0000)	0.9967 (0.0000)	0.9966 (0.0000)	0.9966 (0.0000)	0.9964 (0.0000)
MED-RATIO	0.9994 (0.0000)	0.9992 (0.0001)	0.9988 (0.0001)	0.9987 (0.0000)	0.9985 (0.0001)
MIN-RATIO	0.9993 (0.0001)	0.9991 (0.0001)	0.9986 (0.0001)	0.9984 (0.0001)	0.9982 (0.0001)
ABD-RATIO	0.9993 (0.0001)	0.9991 (0.0000)	0.9990 (0.0000)	0.9990 (0.0000)	0.9989 (0.0000)
BNS-RATIO	0.9993 (0.0001)	0.9991 (0.0000)	0.9990 (0.0000)	0.9989 (0.0000)	0.9988 (0.0000)
CPR-RATIO	0.9991 (0.0001)	0.9988 (0.0000)	0.9987 (0.0000)	0.9986 (0.0000)	0.9985 (0.0000)
MED	0.9937 (0.0000)	0.9936 (0.0001)	0.9934 (0.0001)	0.9934 (0.0001)	0.9934 (0.0001)
MIN	0.9917 (0.0001)	0.9916 (0.0001)	0.9913 (0.0001)	0.9913 (0.0001)	0.9913 (0.0000)
ABD	0.9887 (0.0000)	0.9887 (0.0000)	0.9889 (0.0000)	0.9891 (0.0001)	0.9894 (0.0001)
BNS	0.9886 (0.0000)	0.9886 (0.0000)	0.9887 (0.0000)	0.9889 (0.0001)	0.9892 (0.0000)
CPR	0.9850 (0.0000)	0.9850 (0.0000)	0.9852 (0.0001)	0.9855 (0.0001)	0.9858 (0.0001)
RATIO	0.9787 (0.0044)	0.9654 (0.0046)	0.9457 (0.0066)	0.9238 (0.0066)	0.8991 (0.0045)
LOG	0.9787 (0.0044)	0.9654 (0.0046)	0.9457 (0.0066)	0.9238 (0.0066)	0.8991 (0.0045)
DIFF	0.9764 (0.0044)	0.9633 (0.0044)	0.9446 (0.0060)	0.9248 (0.0059)	0.9029 (0.0038)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_V stressed five times per parameter category.

Table 32 Jump detection test performances when σ_V is stressed under the SVJJ model at the 5-minute sampling frequency.

	σ_V				
	[0, 0.34)	**[0.34, 0.5)**	**[0.5, 0.67)**	**[0.67, 0.87)**	**[0.87, 1]**
MCC					
LM	0.9912 (0.0018)	0.9828 (0.0041)	0.9597 (0.0096)	0.9189 (0.0158)	0.8540 (0.0138)
MED-RATIO	0.9836 (0.0006)	0.9818 (0.0008)	0.9797 (0.0003)	0.9789 (0.0006)	0.9766 (0.0008)
MIN-RATIO	0.9877 (0.0006)	0.9862 (0.0007)	0.9841 (0.0006)	0.9827 (0.0005)	0.9803 (0.0007)
ABD-RATIO	0.9746 (0.0008)	0.9728 (0.0003)	0.9725 (0.0003)	0.9717 (0.0005)	0.9695 (0.0009)
BNS-RATIO	0.9744 (0.0008)	0.9725 (0.0004)	0.9721 (0.0003)	0.9714 (0.0005)	0.9691 (0.0010)
CPR-RATIO	0.9695 (0.0010)	0.9671 (0.0004)	0.9664 (0.0004)	0.9655 (0.0004)	0.9638 (0.0010)
MED	0.9228 (0.0002)	0.9227 (0.0002)	0.9228 (0.0003)	0.9236 (0.0004)	0.9235 (0.0004)
MIN	0.9354 (0.0002)	0.9355 (0.0003)	0.9351 (0.0002)	0.9351 (0.0002)	0.9341 (0.0005)
ABD	0.8823 (0.0003)	0.8818 (0.0003)	0.8839 (0.0007)	0.8866 (0.0005)	0.8879 (0.0001)
BNS	0.8808 (0.0003)	0.8806 (0.0003)	0.8825 (0.0006)	0.8850 (0.0005)	0.8862 (0.0002)
CPR	0.8662 (0.0003)	0.8659 (0.0005)	0.8680 (0.0006)	0.8706 (0.0007)	0.8722 (0.0002)
RATIO	0.7602 (0.0146)	0.7182 (0.0139)	0.6610 (0.0182)	0.6013 (0.0170)	0.5382 (0.0107)
LOG	0.7601 (0.0145)	0.7182 (0.0139)	0.6610 (0.0182)	0.6012 (0.0170)	0.5382 (0.0107)
DIFF	0.7112 (0.0116)	0.6831 (0.0072)	0.6590 (0.0063)	0.6391 (0.0055)	0.6175 (0.0038)
BMI					
LM	0.9927 (0.0000)	0.9926 (0.0000)	0.9926 (0.0000)	0.9926 (0.0000)	0.9924 (0.0000)
MED-RATIO	0.9967 (0.0004)	0.9958 (0.0004)	0.9948 (0.0004)	0.9934 (0.0004)	0.9922 (0.0004)
MIN-RATIO	0.9980 (0.0004)	0.9969 (0.0005)	0.9946 (0.0007)	0.9927 (0.0007)	0.9897 (0.0006)
ABD-RATIO	0.9969 (0.0001)	0.9967 (0.0000)	0.9967 (0.0000)	0.9966 (0.0001)	0.9963 (0.0001)
BNS-RATIO	0.9974 (0.0001)	0.9973 (0.0000)	0.9973 (0.0000)	0.9972 (0.0000)	0.9969 (0.0001)
CPR-RATIO	0.9969 (0.0001)	0.9967 (0.0000)	0.9967 (0.0000)	0.9966 (0.0000)	0.9964 (0.0001)
MED	0.9903 (0.0003)	0.9895 (0.0003)	0.9886 (0.0003)	0.9874 (0.0003)	0.9864 (0.0004)
MIN	0.9925 (0.0004)	0.9916 (0.0005)	0.9894 (0.0007)	0.9877 (0.0007)	0.9848 (0.0006)
ABD	0.9863 (0.0001)	0.9863 (0.0001)	0.9865 (0.0001)	0.9868 (0.0000)	0.9869 (0.0001)
BNS	0.9867 (0.0000)	0.9867 (0.0001)	0.9869 (0.0001)	0.9872 (0.0001)	0.9873 (0.0001)
CPR	0.9847 (0.0000)	0.9847 (0.0001)	0.9850 (0.0001)	0.9853 (0.0001)	0.9855 (0.0000)
RATIO	0.9663 (0.0041)	0.9532 (0.0049)	0.9317 (0.0074)	0.9054 (0.0086)	0.8724 (0.0062)
LOG	0.9662 (0.0041)	0.9532 (0.0048)	0.9317 (0.0074)	0.9054 (0.0085)	0.8724 (0.0062)
DIFF	0.9560 (0.0036)	0.9473 (0.0022)	0.9401 (0.0020)	0.9338 (0.0018)	0.9263 (0.0014)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_V stressed five times per parameter category.

Table 33 Jump detection test performances when σ_V is stressed under the SVJJ model at the 15-minute sampling frequency.

	σ_V				
	[0, 0.34)	**[0.34, 0.5)**	**[0.5, 0.67)**	**[0.67, 0.87)**	**[0.87, 1]**
MCC					
LM	0.9890 (0.0013)	0.9839 (0.0021)	0.9733 (0.0040)	0.9586 (0.0057)	0.9330 (0.0059)
MED-RATIO	0.9565 (0.0006)	0.9557 (0.0004)	0.9542 (0.0004)	0.9531 (0.0007)	0.9500 (0.0004)
MIN-RATIO	0.9695 (0.0015)	0.9667 (0.0008)	0.9643 (0.0004)	0.9613 (0.0014)	0.9570 (0.0009)
ABD-RATIO	0.9430 (0.0007)	0.9421 (0.0002)	0.9431 (0.0004)	0.9437 (0.0003)	0.9446 (0.0003)
BNS-RATIO	0.9422 (0.0005)	0.9416 (0.0001)	0.9427 (0.0003)	0.9433 (0.0003)	0.9442 (0.0002)
CPR-RATIO	0.9409 (0.0007)	0.9400 (0.0002)	0.9410 (0.0004)	0.9415 (0.0003)	0.9426 (0.0003)
MED	0.9070 (0.0003)	0.9063 (0.0003)	0.9059 (0.0002)	0.9072 (0.0002)	0.9062 (0.0002)
MIN	0.9422 (0.0010)	0.9397 (0.0005)	0.9383 (0.0003)	0.9360 (0.0012)	0.9327 (0.0007)
ABD	0.8676 (0.0004)	0.8688 (0.0007)	0.8713 (0.0011)	0.8745 (0.0012)	0.8788 (0.0013)
BNS	0.8648 (0.0005)	0.8663 (0.0007)	0.8692 (0.0009)	0.8722 (0.0014)	0.8767 (0.0010)
CPR	0.8648 (0.0004)	0.8660 (0.0006)	0.8686 (0.0011)	0.8717 (0.0012)	0.8762 (0.0014)
RATIO	0.6505 (0.0060)	0.6393 (0.0022)	0.6328 (0.0010)	0.6308 (0.0007)	0.6263 (0.0007)
LOG	0.6504 (0.0060)	0.6392 (0.0021)	0.6326 (0.0010)	0.6306 (0.0007)	0.6262 (0.0007)
DIFF	0.5697 (0.0041)	0.5623 (0.0011)	0.5603 (0.0004)	0.5624 (0.0005)	0.5640 (0.0006)
BMI					
LM	0.9876 (0.0000)	0.9876 (0.0000)	0.9876 (0.0000)	0.9875 (0.0000)	0.9874 (0.0000)
MED-RATIO	0.9899 (0.0006)	0.9880 (0.0007)	0.9851 (0.0007)	0.9825 (0.0012)	0.9771 (0.0010)
MIN-RATIO	0.9735 (0.0018)	0.9699 (0.0011)	0.9651 (0.0011)	0.9590 (0.0026)	0.9503 (0.0017)
ABD-RATIO	0.9900 (0.0000)	0.9899 (0.0001)	0.9895 (0.0001)	0.9891 (0.0002)	0.9883 (0.0002)
BNS-RATIO	0.9917 (0.0001)	0.9916 (0.0000)	0.9916 (0.0000)	0.9914 (0.0001)	0.9909 (0.0002)
CPR-RATIO	0.9909 (0.0000)	0.9909 (0.0001)	0.9905 (0.0001)	0.9902 (0.0002)	0.9895 (0.0001)
MED	0.9844 (0.0006)	0.9825 (0.0007)	0.9796 (0.0006)	0.9774 (0.0011)	0.9723 (0.0009)
MIN	0.9709 (0.0018)	0.9672 (0.0011)	0.9626 (0.0011)	0.9565 (0.0025)	0.9480 (0.0017)
ABD	0.9808 (0.0001)	0.9809 (0.0001)	0.9807 (0.0001)	0.9808 (0.0000)	0.9805 (0.0001)
BNS	0.9822 (0.0001)	0.9823 (0.0000)	0.9825 (0.0001)	0.9828 (0.0001)	0.9829 (0.0001)
CPR	0.9816 (0.0001)	0.9817 (0.0000)	0.9816 (0.0001)	0.9817 (0.0001)	0.9816 (0.0001)
RATIO	0.9405 (0.0020)	0.9368 (0.0006)	0.9348 (0.0003)	0.9341 (0.0002)	0.9327 (0.0002)
LOG	0.9404 (0.0020)	0.9368 (0.0006)	0.9348 (0.0003)	0.9340 (0.0002)	0.9327 (0.0002)
DIFF	0.9118 (0.0019)	0.9086 (0.0004)	0.9079 (0.0002)	0.9089 (0.0003)	0.9097 (0.0003)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_V stressed five times per parameter category.

C.2 Price jump volatility parameter: σ_S

Table 34 Jump detection test performances when σ_S is stressed under the SVJJ model at the 30-second sampling frequency.

	σ_S					
	[0, 0.03)	**[0.03, 0.39)**	**[0.39, 0.4)**	**[0.4, 0.5)**	**[0.5, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9950 (0.0001)	0.9856 (0.0040)	0.9891 (0.0000)	0.9898 (0.0005)	0.9924 (0.0010)	0.9935 (0.0002)
MED-RATIO	0.9963 (0.0000)	0.9846 (0.0051)	0.9897 (0.0002)	0.9909 (0.0006)	0.9922 (0.0007)	0.9893 (0.0017)
MIN-RATIO	0.9958 (0.0000)	0.9825 (0.0057)	0.9881 (0.0002)	0.9891 (0.0007)	0.9909 (0.0007)	0.9873 (0.0029)
ABD-RATIO	0.9951 (0.0000)	0.9838 (0.0049)	0.9889 (0.0003)	0.9896 (0.0005)	0.9908 (0.0006)	0.9852 (0.0034)
BNS-RATIO	0.9950 (0.0000)	0.9837 (0.0049)	0.9889 (0.0003)	0.9897 (0.0005)	0.9907 (0.0006)	0.9852 (0.0034)
CPR-RATIO	0.9926 (0.0000)	0.9826 (0.0044)	0.9879 (0.0002)	0.9887 (0.0004)	0.9892 (0.0009)	0.9801 (0.0049)
MED	0.9397 (0.0000)	0.9275 (0.0052)	0.9317 (0.0002)	0.9331 (0.0006)	0.9356 (0.0014)	0.9374 (0.0003)
MIN	0.9162 (0.0000)	0.9022 (0.0060)	0.9076 (0.0001)	0.9085 (0.0006)	0.9107 (0.0012)	0.9123 (0.0005)
ABD	0.8974 (0.0000)	0.8853 (0.0051)	0.8904 (0.0003)	0.8911 (0.0004)	0.8933 (0.0013)	0.8946 (0.0001)
BNS	0.8966 (0.0000)	0.8845 (0.0051)	0.8893 (0.0003)	0.8901 (0.0005)	0.8923 (0.0014)	0.8937 (0.0002)
CPR	0.8604 (0.0000)	0.8497 (0.0045)	0.8537 (0.0001)	0.8544 (0.0004)	0.8560 (0.0012)	0.8569 (0.0001)
RATIO	0.8521 (0.0001)	0.8510 (0.0093)	0.8806 (0.0005)	0.8843 (0.0019)	0.8516 (0.0347)	0.6774 (0.0632)
LOG	0.8521 (0.0001)	0.8510 (0.0093)	0.8806 (0.0005)	0.8843 (0.0019)	0.8516 (0.0346)	0.6774 (0.0631)
DIFF	0.8449 (0.0000)	0.8434 (0.0091)	0.8738 (0.0004)	0.8766 (0.0015)	0.8445 (0.0343)	0.6729 (0.0620)
BMI						
LM	0.9972 (0.0000)	0.9849 (0.0051)	0.9890 (0.0001)	0.9901 (0.0008)	0.9922 (0.0011)	0.9935 (0.0002)
MED-RATIO	0.9995 (0.0000)	0.9774 (0.0095)	0.9852 (0.0004)	0.9874 (0.0011)	0.9906 (0.0022)	0.9930 (0.0003)
MIN-RATIO	0.9995 (0.0000)	0.9746 (0.0107)	0.9840 (0.0003)	0.9856 (0.0012)	0.9897 (0.0023)	0.9923 (0.0002)
ABD-RATIO	0.9995 (0.0000)	0.9780 (0.0091)	0.9861 (0.0005)	0.9874 (0.0009)	0.9910 (0.0021)	0.9929 (0.0002)
BNS-RATIO	0.9995 (0.0000)	0.9780 (0.0091)	0.9861 (0.0006)	0.9874 (0.0009)	0.9910 (0.0021)	0.9929 (0.0002)
CPR-RATIO	0.9993 (0.0000)	0.9800 (0.0083)	0.9871 (0.0003)	0.9886 (0.0008)	0.9916 (0.0018)	0.9930 (0.0004)
MED	0.9937 (0.0000)	0.9721 (0.0093)	0.9795 (0.0004)	0.9817 (0.0010)	0.9850 (0.0021)	0.9877 (0.0004)
MIN	0.9911 (0.0000)	0.9666 (0.0105)	0.9758 (0.0002)	0.9774 (0.0012)	0.9813 (0.0023)	0.9844 (0.0003)
ABD	0.9888 (0.0000)	0.9679 (0.0088)	0.9760 (0.0005)	0.9771 (0.0009)	0.9806 (0.0022)	0.9830 (0.0002)
BNS	0.9887 (0.0000)	0.9678 (0.0088)	0.9758 (0.0006)	0.9771 (0.0009)	0.9805 (0.0021)	0.9829 (0.0002)
CPR	0.9839 (0.0000)	0.9655 (0.0078)	0.9725 (0.0002)	0.9738 (0.0007)	0.9765 (0.0019)	0.9787 (0.0003)
RATIO	0.9828 (0.0000)	0.9682 (0.0067)	0.9770 (0.0003)	0.9789 (0.0009)	0.9765 (0.0043)	0.9371 (0.0216)
LOG	0.9828 (0.0000)	0.9682 (0.0067)	0.9770 (0.0003)	0.9789 (0.0009)	0.9765 (0.0043)	0.9371 (0.0216)
DIFF	0.9817 (0.0000)	0.9673 (0.0066)	0.9762 (0.0004)	0.9780 (0.0009)	0.9756 (0.0044)	0.9360 (0.0216)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_S stressed five times per parameter category.

Table 35 Jump detection test performances when σ_S is stressed under the SVJJ model at the 1-minute sampling frequency.

	σ_S					
	[0, 0.03)	**[0.03, 0.39)**	**[0.39, 0.4)**	**[0.4, 0.5)**	**[0.5, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9947 (0.0002)	0.9829 (0.0050)	0.9868 (0.0003)	0.9879 (0.0006)	0.9907 (0.0012)	0.9927 (0.0003)
MED-RATIO	0.9952 (0.0000)	0.9805 (0.0065)	0.9868 (0.0003)	0.9884 (0.0008)	0.9901 (0.0006)	0.9862 (0.0016)
MIN-RATIO	0.9951 (0.0000)	0.9785 (0.0072)	0.9850 (0.0002)	0.9862 (0.0007)	0.9879 (0.0006)	0.9831 (0.0022)
ABD-RATIO	0.9930 (0.0000)	0.9783 (0.0065)	0.9845 (0.0001)	0.9861 (0.0009)	0.9870 (0.0006)	0.9802 (0.0030)
BNS-RATIO	0.9930 (0.0000)	0.9785 (0.0064)	0.9846 (0.0000)	0.9860 (0.0009)	0.9870 (0.0006)	0.9801 (0.0031)
CPR-RATIO	0.9906 (0.0000)	0.9777 (0.0056)	0.9831 (0.0001)	0.9844 (0.0008)	0.9847 (0.0014)	0.9741 (0.0042)
MED	0.9398 (0.0000)	0.9248 (0.0065)	0.9308 (0.0002)	0.9323 (0.0008)	0.9340 (0.0009)	0.9352 (0.0005)
MIN	0.9230 (0.0000)	0.9057 (0.0075)	0.9118 (0.0002)	0.9130 (0.0007)	0.9156 (0.0018)	0.9165 (0.0004)
ABD	0.8955 (0.0000)	0.8800 (0.0068)	0.8863 (0.0001)	0.8875 (0.0007)	0.8893 (0.0013)	0.8903 (0.0006)
BNS	0.8946 (0.0000)	0.8793 (0.0067)	0.8856 (0.0001)	0.8867 (0.0007)	0.8884 (0.0011)	0.8892 (0.0004)
CPR	0.8674 (0.0000)	0.8539 (0.0057)	0.8594 (0.0002)	0.8603 (0.0006)	0.8619 (0.0010)	0.8619 (0.0003)
RATIO	0.8434 (0.0001)	0.8388 (0.0085)	0.8650 (0.0004)	0.8683 (0.0021)	0.8393 (0.0327)	0.6717 (0.0608)
LOG	0.8435 (0.0000)	0.8387 (0.0085)	0.8650 (0.0004)	0.8683 (0.0021)	0.8393 (0.0327)	0.6717 (0.0608)
DIFF	0.8286 (0.0001)	0.8244 (0.0090)	0.8523 (0.0005)	0.8552 (0.0015)	0.8253 (0.0328)	0.6625 (0.0588)
BMI						
LM	0.9967 (0.0000)	0.9790 (0.0077)	0.9858 (0.0004)	0.9870 (0.0006)	0.9896 (0.0016)	0.9916 (0.0003)
MED-RATIO	0.9994 (0.0000)	0.9721 (0.0119)	0.9817 (0.0005)	0.9841 (0.0012)	0.9885 (0.0023)	0.9911 (0.0010)
MIN-RATIO	0.9992 (0.0000)	0.9684 (0.0133)	0.9798 (0.0003)	0.9819 (0.0012)	0.9867 (0.0026)	0.9896 (0.0008)
ABD-RATIO	0.9993 (0.0000)	0.9718 (0.0119)	0.9815 (0.0002)	0.9840 (0.0015)	0.9883 (0.0024)	0.9907 (0.0008)
BNS-RATIO	0.9993 (0.0000)	0.9721 (0.0119)	0.9817 (0.0001)	0.9840 (0.0015)	0.9884 (0.0023)	0.9907 (0.0008)
CPR-RATIO	0.9991 (0.0000)	0.9748 (0.0104)	0.9835 (0.0003)	0.9854 (0.0012)	0.9892 (0.0020)	0.9909 (0.0005)
MED	0.9937 (0.0000)	0.9670 (0.0116)	0.9763 (0.0004)	0.9787 (0.0013)	0.9829 (0.0023)	0.9860 (0.0011)
MIN	0.9917 (0.0000)	0.9613 (0.0131)	0.9725 (0.0004)	0.9746 (0.0013)	0.9794 (0.0027)	0.9827 (0.0010)
ABD	0.9886 (0.0000)	0.9618 (0.0116)	0.9712 (0.0002)	0.9737 (0.0015)	0.9778 (0.0025)	0.9809 (0.0009)
BNS	0.9885 (0.0000)	0.9620 (0.0116)	0.9713 (0.0001)	0.9736 (0.0016)	0.9778 (0.0024)	0.9807 (0.0009)
CPR	0.9849 (0.0000)	0.9618 (0.0098)	0.9699 (0.0003)	0.9719 (0.0014)	0.9756 (0.0021)	0.9780 (0.0006)
RATIO	0.9815 (0.0000)	0.9622 (0.0087)	0.9727 (0.0004)	0.9744 (0.0009)	0.9732 (0.0040)	0.9347 (0.0208)
LOG	0.9815 (0.0000)	0.9622 (0.0087)	0.9727 (0.0004)	0.9744 (0.0009)	0.9732 (0.0040)	0.9347 (0.0208)
DIFF	0.9792 (0.0000)	0.9604 (0.0086)	0.9711 (0.0004)	0.9728 (0.0009)	0.9711 (0.0043)	0.9324 (0.0208)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_S stressed five times per parameter category.

Table 36 Jump detection test performances when σ_S is stressed under the SVJJ model at the 5-minute sampling frequency.

	σ_S					
	[0, 0.03)	**[0.03, 0.39)**	**[0.39, 0.4)**	**[0.4, 0.5)**	**[0.5, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9924 (0.0001)	0.9714 (0.0090)	0.9797 (0.0002)	0.9810 (0.0011)	0.9853 (0.0019)	0.9879 (0.0006)
MED-RATIO	0.9838 (0.0001)	0.9575 (0.0111)	0.9682 (0.0002)	0.9701 (0.0014)	0.9733 (0.0008)	0.9692 (0.0019)
MIN-RATIO	0.9881 (0.0002)	0.9574 (0.0130)	0.9700 (0.0002)	0.9720 (0.0013)	0.9767 (0.0010)	0.9744 (0.0015)
ABD-RATIO	0.9750 (0.0001)	0.9476 (0.0117)	0.9598 (0.0001)	0.9622 (0.0015)	0.9659 (0.0013)	0.9579 (0.0035)
BNS-RATIO	0.9746 (0.0001)	0.9479 (0.0116)	0.9603 (0.0002)	0.9626 (0.0015)	0.9659 (0.0011)	0.9580 (0.0038)
CPR-RATIO	0.9702 (0.0001)	0.9458 (0.0105)	0.9574 (0.0003)	0.9594 (0.0012)	0.9622 (0.0011)	0.9525 (0.0041)
MED	0.9228 (0.0001)	0.8957 (0.0114)	0.9052 (0.0002)	0.9068 (0.0014)	0.9123 (0.0024)	0.9161 (0.0008)
MIN	0.9354 (0.0002)	0.9036 (0.0135)	0.9155 (0.0002)	0.9172 (0.0012)	0.9240 (0.0023)	0.9288 (0.0007)
ABD	0.8823 (0.0001)	0.8537 (0.0122)	0.8640 (0.0002)	0.8656 (0.0014)	0.8705 (0.0023)	0.8750 (0.0007)
BNS	0.8809 (0.0001)	0.8528 (0.0120)	0.8630 (0.0001)	0.8645 (0.0013)	0.8693 (0.0024)	0.8740 (0.0006)
CPR	0.8662 (0.0000)	0.8413 (0.0107)	0.8503 (0.0002)	0.8524 (0.0013)	0.8568 (0.0021)	0.8613 (0.0011)
RATIO	0.7685 (0.0000)	0.7528 (0.0103)	0.7802 (0.0004)	0.7839 (0.0027)	0.7611 (0.0263)	0.6297 (0.0480)
LOG	0.7684 (0.0000)	0.7527 (0.0103)	0.7802 (0.0004)	0.7839 (0.0026)	0.7612 (0.0263)	0.6298 (0.0480)
DIFF	0.7174 (0.0000)	0.7029 (0.0102)	0.7298 (0.0002)	0.7328 (0.0021)	0.7109 (0.0252)	0.5932 (0.0417)
BMI						
LM	0.9926 (0.0001)	0.9549 (0.0160)	0.9691 (0.0003)	0.9712 (0.0019)	0.9775 (0.0028)	0.9809 (0.0010)
MED-RATIO	0.9969 (0.0001)	0.9489 (0.0200)	0.9668 (0.0004)	0.9697 (0.0021)	0.9778 (0.0033)	0.9826 (0.0007)
MIN-RATIO	0.9982 (0.0003)	0.9422 (0.0235)	0.9632 (0.0003)	0.9659 (0.0019)	0.9761 (0.0037)	0.9817 (0.0006)
ABD-RATIO	0.9968 (0.0002)	0.9466 (0.0210)	0.9653 (0.0001)	0.9684 (0.0018)	0.9772 (0.0035)	0.9817 (0.0006)
BNS-RATIO	0.9973 (0.0002)	0.9480 (0.0208)	0.9666 (0.0004)	0.9695 (0.0018)	0.9781 (0.0035)	0.9829 (0.0004)
CPR-RATIO	0.9970 (0.0001)	0.9522 (0.0187)	0.9694 (0.0005)	0.9722 (0.0014)	0.9795 (0.0031)	0.9834 (0.0005)
MED	0.9905 (0.0001)	0.9436 (0.0197)	0.9608 (0.0004)	0.9636 (0.0022)	0.9718 (0.0034)	0.9773 (0.0009)
MIN	0.9927 (0.0003)	0.9374 (0.0234)	0.9579 (0.0004)	0.9607 (0.0019)	0.9710 (0.0037)	0.9770 (0.0008)
ABD	0.9862 (0.0002)	0.9371 (0.0207)	0.9551 (0.0002)	0.9583 (0.0020)	0.9670 (0.0036)	0.9725 (0.0007)
BNS	0.9866 (0.0002)	0.9384 (0.0204)	0.9563 (0.0003)	0.9593 (0.0020)	0.9678 (0.0036)	0.9735 (0.0006)
CPR	0.9847 (0.0001)	0.9418 (0.0183)	0.9580 (0.0004)	0.9609 (0.0016)	0.9679 (0.0031)	0.9730 (0.0007)
RATIO	0.9688 (0.0001)	0.9332 (0.0153)	0.9502 (0.0003)	0.9529 (0.0019)	0.9544 (0.0033)	0.9206 (0.0180)
LOG	0.9687 (0.0001)	0.9332 (0.0153)	0.9502 (0.0003)	0.9529 (0.0019)	0.9544 (0.0033)	0.9206 (0.0180)
DIFF	0.9580 (0.0001)	0.9250 (0.0145)	0.9415 (0.0001)	0.9441 (0.0020)	0.9446 (0.0041)	0.9093 (0.0177)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_S stressed five times per parameter category.

Table 37 Jump detection test performances when σ_S is stressed under the SVJJ model at the 15-minute sampling frequency.

	σ_S					
	[0, 0.03)	**[0.03, 0.39)**	**[0.39, 0.4)**	**[0.4, 0.5)**	**[0.5, 0.8)**	**[0.8, 1]**
MCC						
LM	0.9896 (0.0004)	0.9546 (0.0143)	0.9674 (0.0001)	0.9690 (0.0011)	0.9754 (0.0027)	0.9809 (0.0006)
MED-RATIO	0.9564 (0.0009)	0.9124 (0.0175)	0.9310 (0.0003)	0.9336 (0.0019)	0.9400 (0.0018)	0.9390 (0.0004)
MIN-RATIO	0.9687 (0.0022)	0.9142 (0.0203)	0.9386 (0.0003)	0.9420 (0.0022)	0.9519 (0.0032)	0.9571 (0.0004)
ABD-RATIO	0.9423 (0.0013)	0.8954 (0.0184)	0.9173 (0.0003)	0.9207 (0.0021)	0.9251 (0.0013)	0.9223 (0.0017)
BNS-RATIO	0.9417 (0.0011)	0.8957 (0.0183)	0.9171 (0.0003)	0.9205 (0.0018)	0.9243 (0.0015)	0.9209 (0.0018)
CPR-RATIO	0.9405 (0.0011)	0.8956 (0.0178)	0.9164 (0.0004)	0.9197 (0.0019)	0.9234 (0.0013)	0.9200 (0.0014)
MED	0.9068 (0.0009)	0.8620 (0.0177)	0.8801 (0.0002)	0.8825 (0.0018)	0.8903 (0.0034)	0.8967 (0.0023)
MIN	0.9414 (0.0022)	0.8853 (0.0206)	0.9089 (0.0003)	0.9123 (0.0021)	0.9237 (0.0045)	0.9334 (0.0020)
ABD	0.8664 (0.0013)	0.8181 (0.0186)	0.8379 (0.0003)	0.8407 (0.0021)	0.8492 (0.0030)	0.8592 (0.0019)
BNS	0.8639 (0.0011)	0.8166 (0.0184)	0.8366 (0.0003)	0.8395 (0.0017)	0.8467 (0.0025)	0.8559 (0.0019)
CPR	0.8639 (0.0011)	0.8179 (0.0179)	0.8365 (0.0004)	0.8393 (0.0018)	0.8472 (0.0028)	0.8566 (0.0021)
RATIO	0.6534 (0.0002)	0.6254 (0.0140)	0.6526 (0.0005)	0.6556 (0.0019)	0.6435 (0.0169)	0.5689 (0.0247)
LOG	0.6533 (0.0002)	0.6253 (0.0140)	0.6525 (0.0006)	0.6556 (0.0020)	0.6436 (0.0168)	0.5693 (0.0246)
DIFF	0.5719 (0.0001)	0.5475 (0.0117)	0.5698 (0.0004)	0.5729 (0.0018)	0.5637 (0.0133)	0.5046 (0.0196)
BMI						
LM	0.9873 (0.0007)	0.9233 (0.0259)	0.9466 (0.0002)	0.9497 (0.0020)	0.9598 (0.0042)	0.9678 (0.0008)
MED-RATIO	0.9894 (0.0016)	0.9110 (0.0304)	0.9416 (0.0007)	0.9459 (0.0028)	0.9592 (0.0050)	0.9679 (0.0010)
MIN-RATIO	0.9718 (0.0040)	0.8749 (0.0355)	0.9168 (0.0005)	0.9232 (0.0038)	0.9415 (0.0061)	0.9529 (0.0020)
ABD-RATIO	0.9886 (0.0023)	0.9056 (0.0317)	0.9387 (0.0004)	0.9437 (0.0035)	0.9586 (0.0049)	0.9668 (0.0008)
BNS-RATIO	0.9907 (0.0020)	0.9092 (0.0314)	0.9414 (0.0004)	0.9464 (0.0031)	0.9606 (0.0048)	0.9689 (0.0009)
CPR-RATIO	0.9898 (0.0019)	0.9106 (0.0305)	0.9417 (0.0005)	0.9464 (0.0031)	0.9601 (0.0045)	0.9680 (0.0008)
MED	0.9838 (0.0015)	0.9071 (0.0298)	0.9376 (0.0004)	0.9412 (0.0028)	0.9543 (0.0053)	0.9637 (0.0013)
MIN	0.9691 (0.0040)	0.8728 (0.0353)	0.9150 (0.0005)	0.9210 (0.0037)	0.9393 (0.0063)	0.9509 (0.0021)
ABD	0.9793 (0.0023)	0.8979 (0.0310)	0.9303 (0.0004)	0.9352 (0.0035)	0.9503 (0.0052)	0.9598 (0.0010)
BNS	0.9811 (0.0020)	0.9012 (0.0307)	0.9331 (0.0004)	0.9378 (0.0031)	0.9521 (0.0051)	0.9617 (0.0012)
CPR	0.9804 (0.0019)	0.9029 (0.0298)	0.9335 (0.0004)	0.9379 (0.0031)	0.9517 (0.0049)	0.9610 (0.0010)
RATIO	0.9413 (0.0004)	0.8867 (0.0228)	0.9125 (0.0007)	0.9149 (0.0016)	0.9196 (0.0027)	0.8977 (0.0104)
LOG	0.9413 (0.0004)	0.8866 (0.0228)	0.9125 (0.0008)	0.9150 (0.0016)	0.9197 (0.0027)	0.8979 (0.0104)
DIFF	0.9128 (0.0002)	0.8640 (0.0204)	0.8883 (0.0006)	0.8911 (0.0016)	0.8941 (0.0036)	0.8691 (0.0110)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with σ_S stressed five times per parameter category.

C.3 Price jump mean parameter: μ_S

Table 38 Jump detection test performances when μ_S is stressed under the SVJJ model at the 30-second sampling frequency.

	μ_S								
	[-2, 0)	**[0, 0.017)**	**[0.017, 0.03)**	**[0.03, 0.04)**	**[0.04, 0.08)**	**[0.08, 0.68)**	**[0.68, 1.2)**	**[1.2, 1.55)**	**[1.55, 2]**
MCC									
LM	0.9977 (0.0002)	0.8327 (0.0297)	0.8851 (0.0126)	0.9181 (0.0056)	0.9494 (0.0125)	0.9935 (0.0066)	0.9976 (0.0002)	0.9980 (0.0001)	0.9982 (0.0001)
MED-RATIO	0.9799 (0.0047)	0.7662 (0.0413)	0.8417 (0.0267)	0.9115 (0.0097)	0.9602 (0.0184)	0.9916 (0.0049)	0.9674 (0.0071)	0.9540 (0.0007)	0.9641 (0.0055)
MIN-RATIO	0.9716 (0.0070)	0.7438 (0.0439)	0.8193 (0.0309)	0.8999 (0.0120)	0.9547 (0.0206)	0.9886 (0.0081)	0.9527 (0.0090)	0.9356 (0.0008)	0.9458 (0.0071)
ABD-RATIO	0.9647 (0.0080)	0.7691 (0.0407)	0.8446 (0.0256)	0.9124 (0.0101)	0.9600 (0.0180)	0.9862 (0.0099)	0.9417 (0.0113)	0.9196 (0.0008)	0.9325 (0.0079)
BNS-RATIO	0.9644 (0.0082)	0.7700 (0.0405)	0.8454 (0.0254)	0.9129 (0.0101)	0.9601 (0.0180)	0.9861 (0.0098)	0.9414 (0.0114)	0.9192 (0.0008)	0.9319 (0.0079)
CPR-RATIO	0.9508 (0.0112)	0.7864 (0.0381)	0.8605 (0.0232)	0.9199 (0.0089)	0.9621 (0.0163)	0.9804 (0.0141)	0.9182 (0.0159)	0.8878 (0.0010)	0.9045 (0.0113)
MED	0.9407 (0.0005)	0.7022 (0.0428)	0.7806 (0.0271)	0.8521 (0.0100)	0.9022 (0.0188)	0.9402 (0.0016)	0.9430 (0.0011)	0.9501 (0.0025)	0.9639 (0.0057)
MIN	0.9159 (0.0003)	0.6527 (0.0460)	0.7324 (0.0319)	0.8159 (0.0124)	0.8726 (0.0212)	0.9156 (0.0016)	0.9202 (0.0023)	0.9305 (0.0027)	0.9456 (0.0073)
ABD	0.8968 (0.0005)	0.6625 (0.0422)	0.7420 (0.0265)	0.8116 (0.0101)	0.8604 (0.0184)	0.8972 (0.0014)	0.9022 (0.0026)	0.9135 (0.0030)	0.9323 (0.0081)
BNS	0.8960 (0.0004)	0.6624 (0.0419)	0.7418 (0.0263)	0.8112 (0.0102)	0.8596 (0.0184)	0.8965 (0.0014)	0.9016 (0.0025)	0.9131 (0.0031)	0.9316 (0.0082)
CPR	0.8594 (0.0005)	0.6489 (0.0387)	0.7258 (0.0234)	0.7849 (0.0088)	0.8271 (0.0163)	0.8595 (0.0010)	0.8642 (0.0031)	0.8793 (0.0043)	0.9041 (0.0116)
RATIO	0.4149 (0.0768)	0.7014 (0.0355)	0.7743 (0.0202)	0.8240 (0.0075)	0.8603 (0.0133)	0.6854 (0.1709)	0.2519 (0.0693)	0.0788 (0.0213)	0.0277 (0.0068)
LOG	0.4149 (0.0768)	0.7014 (0.0355)	0.7742 (0.0202)	0.8240 (0.0075)	0.8603 (0.0134)	0.6854 (0.1709)	0.2519 (0.0693)	0.0788 (0.0214)	0.0277 (0.0068)
DIFF	0.4130 (0.0762)	0.6952 (0.0355)	0.7679 (0.0201)	0.8174 (0.0076)	0.8533 (0.0125)	0.6805 (0.1687)	0.2517 (0.0687)	0.0794 (0.0215)	0.0278 (0.0071)
BMI									
LM	0.9972 (0.0000)	0.7415 (0.0479)	0.8550 (0.0255)	0.9194 (0.0097)	0.9660 (0.0161)	0.9967 (0.0010)	0.9972 (0.0000)	0.9972 (0.0000)	0.9972 (0.0000)
MED-RATIO	0.9980 (0.0004)	0.6122 (0.0624)	0.7294 (0.0428)	0.8453 (0.0168)	0.9315 (0.0330)	0.9980 (0.0022)	0.9968 (0.0007)	0.9953 (0.0000)	0.9962 (0.0005)
MIN-RATIO	0.9973 (0.0007)	0.5811 (0.0650)	0.6957 (0.0488)	0.8272 (0.0206)	0.9230 (0.0366)	0.9977 (0.0025)	0.9953 (0.0010)	0.9933 (0.0001)	0.9942 (0.0007)
ABD-RATIO	0.9967 (0.0008)	0.6189 (0.0621)	0.7364 (0.0416)	0.8493 (0.0174)	0.9332 (0.0322)	0.9978 (0.0020)	0.9943 (0.0013)	0.9915 (0.0001)	0.9927 (0.0008)
BNS-RATIO	0.9967 (0.0008)	0.6201 (0.0616)	0.7378 (0.0414)	0.8504 (0.0175)	0.9336 (0.0322)	0.9977 (0.0020)	0.9942 (0.0013)	0.9915 (0.0001)	0.9927 (0.0009)
CPR-RATIO	0.9952 (0.0011)	0.6478 (0.0591)	0.7655 (0.0381)	0.8653 (0.0155)	0.9400 (0.0293)	0.9973 (0.0018)	0.9916 (0.0019)	0.9876 (0.0002)	0.9893 (0.0013)
MED	0.9938 (0.0001)	0.6133 (0.0617)	0.7295 (0.0418)	0.8431 (0.0165)	0.9273 (0.0322)	0.9927 (0.0025)	0.9941 (0.0001)	0.9948 (0.0003)	0.9962 (0.0006)
MIN	0.9911 (0.0000)	0.5788 (0.0640)	0.6933 (0.0475)	0.8224 (0.0201)	0.9159 (0.0357)	0.9898 (0.0028)	0.9916 (0.0002)	0.9926 (0.0003)	0.9942 (0.0007)
ABD	0.9887 (0.0001)	0.6183 (0.0602)	0.7347 (0.0402)	0.8436 (0.0166)	0.9246 (0.0310)	0.9879 (0.0023)	0.9894 (0.0003)	0.9906 (0.0003)	0.9927 (0.0009)
BNS	0.9887 (0.0001)	0.6195 (0.0598)	0.7360 (0.0399)	0.8447 (0.0166)	0.9249 (0.0310)	0.9878 (0.0023)	0.9894 (0.0003)	0.9907 (0.0003)	0.9927 (0.0009)
CPR	0.9838 (0.0001)	0.6502 (0.0563)	0.7647 (0.0362)	0.8581 (0.0143)	0.9280 (0.0274)	0.9829 (0.0019)	0.9844 (0.0004)	0.9863 (0.0005)	0.9893 (0.0013)
RATIO	0.7816 (0.0632)	0.6856 (0.0536)	0.7955 (0.0316)	0.8757 (0.0124)	0.9386 (0.0243)	0.9276 (0.0685)	0.5451 (0.1431)	0.1215 (0.0556)	0.0096 (0.0089)
LOG	0.7816 (0.0632)	0.6856 (0.0536)	0.7954 (0.0316)	0.8757 (0.0124)	0.9386 (0.0243)	0.9276 (0.0685)	0.5451 (0.1431)	0.1215 (0.0556)	0.0096 (0.0089)
DIFF	0.7803 (0.0633)	0.6877 (0.0534)	0.7976 (0.0315)	0.8768 (0.0125)	0.9385 (0.0236)	0.9265 (0.0686)	0.5451 (0.1420)	0.1234 (0.0559)	0.0100 (0.0092)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_S stressed five times per parameter category.

Table 39 Jump detection test performances when μ_S is stressed under the SVJJ model at the 1-minute sampling frequency.

	μ_S								
	[-2, 0)	**[0, 0.017)**	**[0.017, 0.03)**	**[0.03, 0.04)**	**[0.04, 0.08)**	**[0.08, 0.68)**	**[0.68, 1.2)**	**[1.2, 1.55)**	**[1.55, 2]**
MCC									
LM	0.9974 (0.0002)	0.7880 (0.0370)	0.8547 (0.0204)	0.9059 (0.0083)	0.9464 (0.0162)	0.9933 (0.0055)	0.9973 (0.0002)	0.9978 (0.0001)	0.9980 (0.0001)
MED-RATIO	0.9807 (0.0038)	0.7230 (0.0468)	0.7981 (0.0339)	0.8872 (0.0138)	0.9496 (0.0232)	0.9893 (0.0059)	0.9662 (0.0056)	0.9560 (0.0022)	0.9702 (0.0066)
MIN-RATIO	0.9746 (0.0058)	0.6966 (0.0476)	0.7671 (0.0370)	0.8704 (0.0165)	0.9418 (0.0266)	0.9863 (0.0076)	0.9548 (0.0079)	0.9426 (0.0023)	0.9603 (0.0083)
ABD-RATIO	0.9635 (0.0083)	0.7207 (0.0463)	0.7955 (0.0337)	0.8849 (0.0138)	0.9473 (0.0232)	0.9828 (0.0101)	0.9401 (0.0108)	0.9237 (0.0031)	0.9465 (0.0114)
BNS-RATIO	0.9632 (0.0084)	0.7221 (0.0461)	0.7974 (0.0337)	0.8859 (0.0139)	0.9477 (0.0230)	0.9826 (0.0104)	0.9395 (0.0108)	0.9230 (0.0031)	0.9461 (0.0115)
CPR-RATIO	0.9527 (0.0104)	0.7405 (0.0442)	0.8170 (0.0302)	0.8956 (0.0120)	0.9504 (0.0204)	0.9765 (0.0136)	0.9218 (0.0125)	0.9024 (0.0033)	0.9309 (0.0146)
MED	0.9425 (0.0011)	0.6608 (0.0474)	0.7383 (0.0351)	0.8293 (0.0136)	0.8924 (0.0237)	0.9388 (0.0012)	0.9422 (0.0030)	0.9527 (0.0039)	0.9701 (0.0067)
MIN	0.9241 (0.0006)	0.6119 (0.0492)	0.6851 (0.0388)	0.7929 (0.0170)	0.8664 (0.0278)	0.9209 (0.0017)	0.9253 (0.0031)	0.9386 (0.0044)	0.9602 (0.0084)
ABD	0.8963 (0.0006)	0.6122 (0.0478)	0.6899 (0.0350)	0.7829 (0.0140)	0.8473 (0.0243)	0.8945 (0.0014)	0.9009 (0.0037)	0.9180 (0.0058)	0.9462 (0.0117)
BNS	0.8957 (0.0006)	0.6129 (0.0475)	0.6910 (0.0351)	0.7834 (0.0140)	0.8471 (0.0242)	0.8934 (0.0012)	0.9001 (0.0037)	0.9172 (0.0058)	0.9459 (0.0117)
CPR	0.8696 (0.0008)	0.6123 (0.0446)	0.6905 (0.0305)	0.7708 (0.0117)	0.8257 (0.0210)	0.8660 (0.0008)	0.8741 (0.0050)	0.8953 (0.0065)	0.9306 (0.0149)
RATIO	0.4126 (0.0766)	0.6431 (0.0416)	0.7244 (0.0263)	0.7916 (0.0103)	0.8384 (0.0167)	0.6786 (0.1669)	0.2525 (0.0677)	0.0812 (0.0216)	0.0282 (0.0077)
LOG	0.4126 (0.0766)	0.6430 (0.0416)	0.7244 (0.0263)	0.7916 (0.0103)	0.8384 (0.0167)	0.6787 (0.1668)	0.2525 (0.0677)	0.0812 (0.0216)	0.0283 (0.0077)
DIFF	0.4092 (0.0754)	0.6332 (0.0410)	0.7138 (0.0254)	0.7787 (0.0098)	0.8253 (0.0167)	0.6688 (0.1621)	0.2522 (0.0665)	0.0828 (0.0218)	0.0290 (0.0080)
BMI									
LM	0.9967 (0.0000)	0.6658 (0.0555)	0.7965 (0.0367)	0.8880 (0.0140)	0.9526 (0.0230)	0.9961 (0.0013)	0.9967 (0.0000)	0.9967 (0.0000)	0.9967 (0.0000)
MED-RATIO	0.9981 (0.0004)	0.5510 (0.0673)	0.6628 (0.0525)	0.8058 (0.0231)	0.9138 (0.0411)	0.9976 (0.0028)	0.9966 (0.0006)	0.9954 (0.0002)	0.9968 (0.0007)
MIN-RATIO	0.9974 (0.0005)	0.5160 (0.0664)	0.6180 (0.0555)	0.7800 (0.0273)	0.9020 (0.0468)	0.9969 (0.0034)	0.9955 (0.0009)	0.9940 (0.0002)	0.9957 (0.0008)
ABD-RATIO	0.9966 (0.0008)	0.5517 (0.0664)	0.6632 (0.0523)	0.8063 (0.0231)	0.9145 (0.0413)	0.9972 (0.0024)	0.9940 (0.0012)	0.9919 (0.0003)	0.9942 (0.0012)
BNS-RATIO	0.9966 (0.0008)	0.5539 (0.0662)	0.6662 (0.0522)	0.8081 (0.0232)	0.9154 (0.0411)	0.9972 (0.0024)	0.9940 (0.0012)	0.9918 (0.0003)	0.9942 (0.0012)
CPR-RATIO	0.9954 (0.0011)	0.5844 (0.0648)	0.7001 (0.0477)	0.8284 (0.0204)	0.9238 (0.0366)	0.9967 (0.0021)	0.9920 (0.0015)	0.9893 (0.0003)	0.9924 (0.0016)
MED	0.9940 (0.0001)	0.5543 (0.0654)	0.6649 (0.0517)	0.8047 (0.0219)	0.9101 (0.0405)	0.9923 (0.0029)	0.9939 (0.0003)	0.9950 (0.0004)	0.9967 (0.0007)
MIN	0.9919 (0.0002)	0.5158 (0.0648)	0.6164 (0.0548)	0.7764 (0.0267)	0.8961 (0.0465)	0.9899 (0.0036)	0.9920 (0.0003)	0.9935 (0.0005)	0.9957 (0.0009)
ABD	0.9888 (0.0001)	0.5524 (0.0644)	0.6618 (0.0508)	0.8019 (0.0222)	0.9065 (0.0404)	0.9873 (0.0027)	0.9892 (0.0004)	0.9911 (0.0006)	0.9942 (0.0012)
BNS	0.9887 (0.0001)	0.5546 (0.0641)	0.6647 (0.0508)	0.8039 (0.0223)	0.9075 (0.0401)	0.9872 (0.0027)	0.9891 (0.0004)	0.9910 (0.0006)	0.9942 (0.0012)
CPR	0.9853 (0.0001)	0.5896 (0.0618)	0.7015 (0.0451)	0.8244 (0.0187)	0.9144 (0.0349)	0.9838 (0.0022)	0.9857 (0.0006)	0.9883 (0.0008)	0.9923 (0.0017)
RATIO	0.7801 (0.0636)	0.6223 (0.0599)	0.7390 (0.0395)	0.8430 (0.0166)	0.9228 (0.0303)	0.9260 (0.0683)	0.5477 (0.1396)	0.1282 (0.0566)	0.0110 (0.0100)
LOG	0.7801 (0.0636)	0.6223 (0.0599)	0.7390 (0.0395)	0.8430 (0.0166)	0.9228 (0.0303)	0.9260 (0.0683)	0.5478 (0.1396)	0.1283 (0.0566)	0.0110 (0.0100)
DIFF	0.7779 (0.0635)	0.6260 (0.0591)	0.7424 (0.0386)	0.8441 (0.0160)	0.9224 (0.0295)	0.9237 (0.0682)	0.5483 (0.1375)	0.1324 (0.0572)	0.0121 (0.0108)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_S stressed five times per parameter category.

Table 40 Jump detection test performances when μ_S is stressed under the SVJJ model at the 5-minute sampling frequency.

	μ_S								
	[-2, 0)	**[0, 0.017)**	**[0.017, 0.03)**	**[0.03, 0.04)**	**[0.04, 0.08)**	**[0.08, 0.68)**	**[0.68, 1.2)**	**[1.2, 1.55)**	**[1.55, 2]**
MCC									
LM	0.9950 (0.0002)	0.6473 (0.0498)	0.7005 (0.0437)	0.8278 (0.0211)	0.9194 (0.0317)	0.9916 (0.0052)	0.9957 (0.0002)	0.9960 (0.0001)	0.9962 (0.0000)
MED-RATIO	0.9646 (0.0040)	0.5735 (0.0531)	0.6085 (0.0473)	0.7642 (0.0289)	0.8913 (0.0460)	0.9752 (0.0056)	0.9579 (0.0028)	0.9695 (0.0060)	0.9905 (0.0046)
MIN-RATIO	0.9713 (0.0030)	0.5401 (0.0528)	0.5570 (0.0480)	0.7205 (0.0325)	0.8749 (0.0558)	0.9811 (0.0046)	0.9656 (0.0025)	0.9750 (0.0049)	0.9925 (0.0039)
ABD-RATIO	0.9432 (0.0060)	0.5555 (0.0531)	0.5853 (0.0484)	0.7434 (0.0297)	0.8782 (0.0491)	0.9641 (0.0092)	0.9340 (0.0040)	0.9497 (0.0091)	0.9838 (0.0082)
BNS-RATIO	0.9429 (0.0059)	0.5597 (0.0530)	0.5909 (0.0496)	0.7484 (0.0295)	0.8808 (0.0480)	0.9639 (0.0095)	0.9332 (0.0041)	0.9495 (0.0094)	0.9840 (0.0084)
CPR-RATIO	0.9345 (0.0071)	0.5797 (0.0535)	0.6205 (0.0469)	0.7703 (0.0266)	0.8880 (0.0419)	0.9585 (0.0101)	0.9243 (0.0048)	0.9436 (0.0108)	0.9827 (0.0091)
MED	0.9285 (0.0025)	0.5004 (0.0553)	0.5382 (0.0490)	0.6979 (0.0295)	0.8273 (0.0468)	0.9223 (0.0050)	0.9387 (0.0065)	0.9673 (0.0073)	0.9904 (0.0047)
MIN	0.9393 (0.0023)	0.4708 (0.0557)	0.4872 (0.0501)	0.6575 (0.0344)	0.8179 (0.0575)	0.9357 (0.0061)	0.9494 (0.0046)	0.9730 (0.0059)	0.9923 (0.0041)
ABD	0.8897 (0.0039)	0.4494 (0.0532)	0.4808 (0.0488)	0.6403 (0.0305)	0.7789 (0.0504)	0.8818 (0.0062)	0.9057 (0.0095)	0.9466 (0.0107)	0.9836 (0.0084)
BNS	0.8883 (0.0038)	0.4525 (0.0532)	0.4854 (0.0496)	0.6440 (0.0304)	0.7802 (0.0494)	0.8805 (0.0060)	0.9043 (0.0098)	0.9464 (0.0111)	0.9837 (0.0086)
CPR	0.8752 (0.0040)	0.4697 (0.0532)	0.5145 (0.0465)	0.6626 (0.0273)	0.7806 (0.0417)	0.8676 (0.0063)	0.8929 (0.0101)	0.9402 (0.0126)	0.9824 (0.0093)
RATIO	0.4116 (0.0690)	0.4411 (0.0488)	0.4995 (0.0436)	0.6295 (0.0204)	0.7235 (0.0334)	0.6354 (0.1350)	0.2684 (0.0602)	0.1144 (0.0213)	0.0532 (0.0119)
LOG	0.4114 (0.0690)	0.4411 (0.0488)	0.4995 (0.0437)	0.6295 (0.0204)	0.7235 (0.0334)	0.6356 (0.1350)	0.2686 (0.0602)	0.1146 (0.0213)	0.0534 (0.0119)
DIFF	0.4011 (0.0618)	0.4102 (0.0465)	0.4691 (0.0404)	0.5893 (0.0197)	0.6773 (0.0313)	0.5993 (0.1192)	0.2767 (0.0493)	0.1652 (0.0124)	0.1507 (0.0108)
BMI									
LM	0.9927 (0.0000)	0.4609 (0.0601)	0.5507 (0.0636)	0.7428 (0.0331)	0.8903 (0.0519)	0.9913 (0.0030)	0.9927 (0.0000)	0.9927 (0.0000)	0.9927 (0.0000)
MED-RATIO	0.9952 (0.0004)	0.3760 (0.0638)	0.4208 (0.0598)	0.6321 (0.0428)	0.8337 (0.0769)	0.9931 (0.0066)	0.9946 (0.0003)	0.9956 (0.0006)	0.9978 (0.0005)
MIN-RATIO	0.9968 (0.0003)	0.3306 (0.0600)	0.3525 (0.0573)	0.5634 (0.0462)	0.7998 (0.0914)	0.9937 (0.0088)	0.9962 (0.0003)	0.9970 (0.0005)	0.9988 (0.0004)
ABD-RATIO	0.9932 (0.0007)	0.3667 (0.0619)	0.4050 (0.0590)	0.6141 (0.0434)	0.8243 (0.0810)	0.9926 (0.0067)	0.9922 (0.0006)	0.9935 (0.0009)	0.9971 (0.0008)
BNS-RATIO	0.9940 (0.0007)	0.3721 (0.0622)	0.4127 (0.0604)	0.6221 (0.0432)	0.8293 (0.0796)	0.9932 (0.0065)	0.9928 (0.0006)	0.9943 (0.0010)	0.9979 (0.0009)
CPR-RATIO	0.9932 (0.0008)	0.4022 (0.0649)	0.4568 (0.0594)	0.6612 (0.0399)	0.8484 (0.0700)	0.9931 (0.0057)	0.9920 (0.0007)	0.9937 (0.0011)	0.9979 (0.0010)
MED	0.9912 (0.0003)	0.3801 (0.0635)	0.4283 (0.0591)	0.6355 (0.0418)	0.8314 (0.0748)	0.9875 (0.0068)	0.9924 (0.0007)	0.9953 (0.0008)	0.9978 (0.0005)
MIN	0.9933 (0.0002)	0.3323 (0.0594)	0.3552 (0.0566)	0.5632 (0.0459)	0.7968 (0.0903)	0.9890 (0.0090)	0.9944 (0.0005)	0.9968 (0.0006)	0.9988 (0.0004)
ABD	0.9867 (0.0004)	0.3693 (0.0603)	0.4094 (0.0578)	0.6128 (0.0426)	0.8185 (0.0790)	0.9831 (0.0074)	0.9886 (0.0010)	0.9931 (0.0012)	0.9970 (0.0009)
BNS	0.9873 (0.0004)	0.3747 (0.0609)	0.4171 (0.0592)	0.6207 (0.0425)	0.8235 (0.0776)	0.9836 (0.0072)	0.9892 (0.0011)	0.9939 (0.0012)	0.9979 (0.0009)
CPR	0.9857 (0.0005)	0.4095 (0.0638)	0.4672 (0.0578)	0.6643 (0.0391)	0.8436 (0.0665)	0.9823 (0.0064)	0.9879 (0.0011)	0.9932 (0.0014)	0.9978 (0.0010)
RATIO	0.7866 (0.0581)	0.4464 (0.0634)	0.5237 (0.0578)	0.7050 (0.0307)	0.8542 (0.0558)	0.9174 (0.0597)	0.5880 (0.1168)	0.2182 (0.0600)	0.0611 (0.0247)
LOG	0.7864 (0.0581)	0.4464 (0.0634)	0.5237 (0.0579)	0.7050 (0.0307)	0.8542 (0.0558)	0.9175 (0.0596)	0.5883 (0.1167)	0.2187 (0.0600)	0.0615 (0.0247)
DIFF	0.7817 (0.0544)	0.4559 (0.0630)	0.5379 (0.0564)	0.7112 (0.0300)	0.8522 (0.0527)	0.9070 (0.0582)	0.6134 (0.0894)	0.3704 (0.0332)	0.3331 (0.0299)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_S stressed five times per parameter category.

Table 41 Jump detection test performances when μ_S is stressed under the SVJJ model at the 15-minute sampling frequency.

	μ_S								
	[-2, 0)	**[0, 0.017)**	**[0.017, 0.03)**	**[0.03, 0.04)**	**[0.04, 0.08)**	**[0.08, 0.68)**	**[0.68, 1.2)**	**[1.2, 1.55)**	**[1.55, 2]**
MCC									
LM	0.9925 (0.0002)	0.5311 (0.0510)	0.5208 (0.0391)	0.6824 (0.0363)	0.8566 (0.0644)	0.9880 (0.0072)	0.9932 (0.0003)	0.9936 (0.0000)	0.9936 (0.0000)
MED-RATIO	0.9456 (0.0011)	0.3955 (0.0533)	0.3858 (0.0401)	0.5481 (0.0418)	0.7620 (0.0872)	0.9487 (0.0067)	0.9522 (0.0068)	0.9814 (0.0060)	0.9955 (0.0017)
MIN-RATIO	0.9726 (0.0003)	0.3527 (0.0392)	0.3439 (0.0298)	0.4740 (0.0354)	0.6981 (0.1070)	0.9654 (0.0167)	0.9765 (0.0031)	0.9908 (0.0030)	0.9979 (0.0007)
ABD-RATIO	0.9271 (0.0021)	0.3694 (0.0515)	0.3567 (0.0353)	0.5059 (0.0384)	0.7260 (0.0941)	0.9310 (0.0073)	0.9313 (0.0079)	0.9721 (0.0092)	0.9942 (0.0027)
BNS-RATIO	0.9253 (0.0020)	0.3745 (0.0522)	0.3615 (0.0357)	0.5125 (0.0382)	0.7326 (0.0927)	0.9300 (0.0064)	0.9294 (0.0081)	0.9719 (0.0098)	0.9950 (0.0030)
CPR-RATIO	0.9255 (0.0019)	0.3802 (0.0534)	0.3704 (0.0371)	0.5239 (0.0386)	0.7384 (0.0903)	0.9290 (0.0066)	0.9301 (0.0086)	0.9722 (0.0094)	0.9947 (0.0028)
MED	0.9179 (0.0038)	0.3400 (0.0543)	0.3322 (0.0419)	0.4945 (0.0410)	0.7099 (0.0880)	0.9068 (0.0115)	0.9396 (0.0125)	0.9799 (0.0069)	0.9954 (0.0018)
MIN	0.9584 (0.0027)	0.3004 (0.0444)	0.2867 (0.0337)	0.4289 (0.0379)	0.6634 (0.1103)	0.9414 (0.0205)	0.9699 (0.0065)	0.9902 (0.0033)	0.9978 (0.0008)
ABD	0.8847 (0.0058)	0.2898 (0.0502)	0.2805 (0.0350)	0.4279 (0.0374)	0.6454 (0.0945)	0.8669 (0.0154)	0.9112 (0.0161)	0.9697 (0.0103)	0.9940 (0.0029)
BNS	0.8822 (0.0066)	0.2943 (0.0510)	0.2849 (0.0350)	0.4335 (0.0374)	0.6507 (0.0928)	0.8643 (0.0141)	0.9090 (0.0166)	0.9699 (0.0108)	0.9949 (0.0031)
CPR	0.8827 (0.0062)	0.3025 (0.0519)	0.2951 (0.0368)	0.4473 (0.0372)	0.6585 (0.0902)	0.8648 (0.0144)	0.9097 (0.0169)	0.9699 (0.0105)	0.9945 (0.0029)
RATIO	0.4670 (0.0331)	0.2558 (0.0407)	0.2706 (0.0363)	0.4055 (0.0311)	0.5528 (0.0560)	0.5790 (0.0698)	0.3997 (0.0240)	0.4042 (0.0296)	0.6166 (0.1008)
LOG	0.4664 (0.0332)	0.2556 (0.0408)	0.2706 (0.0363)	0.4059 (0.0310)	0.5531 (0.0561)	0.5794 (0.0696)	0.4004 (0.0239)	0.4057 (0.0298)	0.6191 (0.1010)
DIFF	0.4243 (0.0258)	0.2278 (0.0355)	0.2460 (0.0331)	0.3650 (0.0256)	0.4882 (0.0468)	0.5137 (0.0550)	0.3764 (0.0157)	0.4198 (0.0410)	0.6788 (0.1083)
BMI									
LM	0.9876 (0.0000)	0.3192 (0.0522)	0.3246 (0.0464)	0.5265 (0.0490)	0.7819 (0.1009)	0.9845 (0.0069)	0.9876 (0.0000)	0.9876 (0.0000)	0.9876 (0.0000)
MED-RATIO	0.9900 (0.0001)	0.2261 (0.0494)	0.2201 (0.0390)	0.3913 (0.0485)	0.6752 (0.1276)	0.9828 (0.0166)	0.9910 (0.0007)	0.9939 (0.0006)	0.9953 (0.0002)
MIN-RATIO	0.9867 (0.0012)	0.1527 (0.0348)	0.1432 (0.0261)	0.2719 (0.0383)	0.5528 (0.1474)	0.9684 (0.0314)	0.9906 (0.0019)	0.9958 (0.0006)	0.9977 (0.0002)
ABD-RATIO	0.9883 (0.0004)	0.2159 (0.0461)	0.2096 (0.0334)	0.3622 (0.0430)	0.6449 (0.1334)	0.9809 (0.0188)	0.9889 (0.0008)	0.9930 (0.0010)	0.9954 (0.0003)
BNS-RATIO	0.9903 (0.0003)	0.2225 (0.0471)	0.2159 (0.0340)	0.3722 (0.0438)	0.6571 (0.1321)	0.9833 (0.0170)	0.9906 (0.0008)	0.9950 (0.0010)	0.9974 (0.0003)
CPR-RATIO	0.9891 (0.0004)	0.2287 (0.0488)	0.2244 (0.0361)	0.3855 (0.0445)	0.6660 (0.1295)	0.9823 (0.0172)	0.9897 (0.0009)	0.9940 (0.0010)	0.9964 (0.0003)
MED	0.9868 (0.0006)	0.2303 (0.0493)	0.2277 (0.0400)	0.3968 (0.0472)	0.6764 (0.1256)	0.9783 (0.0168)	0.9895 (0.0013)	0.9937 (0.0007)	0.9953 (0.0002)
MIN	0.9853 (0.0015)	0.1538 (0.0345)	0.1458 (0.0268)	0.2735 (0.0380)	0.5526 (0.1465)	0.9661 (0.0316)	0.9899 (0.0022)	0.9957 (0.0007)	0.9977 (0.0002)
ABD	0.9831 (0.0006)	0.2184 (0.0461)	0.2137 (0.0335)	0.3652 (0.0423)	0.6423 (0.1308)	0.9731 (0.0196)	0.9864 (0.0018)	0.9927 (0.0011)	0.9954 (0.0003)
BNS	0.9849 (0.0008)	0.2244 (0.0473)	0.2199 (0.0340)	0.3747 (0.0428)	0.6540 (0.1296)	0.9752 (0.0177)	0.9880 (0.0019)	0.9947 (0.0011)	0.9974 (0.0003)
CPR	0.9838 (0.0007)	0.2326 (0.0488)	0.2300 (0.0362)	0.3904 (0.0431)	0.6643 (0.1265)	0.9745 (0.0179)	0.9872 (0.0019)	0.9938 (0.0011)	0.9964 (0.0003)
RATIO	0.8527 (0.0210)	0.3082 (0.0548)	0.3305 (0.0491)	0.5181 (0.0456)	0.7455 (0.0910)	0.9073 (0.0285)	0.7997 (0.0221)	0.7996 (0.0224)	0.9100 (0.0352)
LOG	0.8523 (0.0211)	0.3079 (0.0549)	0.3305 (0.0491)	0.5185 (0.0455)	0.7458 (0.0911)	0.9075 (0.0284)	0.8004 (0.0219)	0.8010 (0.0225)	0.9111 (0.0350)
DIFF	0.8214 (0.0206)	0.3223 (0.0542)	0.3518 (0.0508)	0.5371 (0.0412)	0.7435 (0.0808)	0.8784 (0.0298)	0.7775 (0.0162)	0.8096 (0.0291)	0.9303 (0.0324)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\lambda = 12$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_S stressed five times per parameter category.

C.4 Jump intensity parameter: λ

Table 42 Jump detection test performances when λ is stressed under the SVJJ model at the 30-second sampling frequency.

	λ				
	[1, 3)	**[3, 11)**	**[11, 16)**	**[16, 21.5)**	**[21.5, 30]**
MCC					
LM	0.9824 (0.0027)	0.9898 (0.0039)	0.9956 (0.0006)	0.9966 (0.0002)	0.9975 (0.0005)
MED-RATIO	0.9888 (0.0018)	0.9938 (0.0025)	0.9971 (0.0005)	0.9977 (0.0002)	0.9980 (0.0001)
MIN-RATIO	0.9842 (0.0019)	0.9918 (0.0029)	0.9965 (0.0002)	0.9971 (0.0004)	0.9974 (0.0002)
ABD-RATIO	0.9791 (0.0035)	0.9892 (0.0041)	0.9955 (0.0002)	0.9963 (0.0006)	0.9969 (0.0003)
BNS-RATIO	0.9792 (0.0034)	0.9891 (0.0042)	0.9955 (0.0002)	0.9963 (0.0007)	0.9969 (0.0002)
CPR-RATIO	0.9707 (0.0033)	0.9847 (0.0056)	0.9933 (0.0003)	0.9943 (0.0007)	0.9955 (0.0004)
MED	0.7675 (0.0211)	0.8832 (0.0354)	0.9418 (0.0058)	0.9570 (0.0022)	0.9678 (0.0033)
MIN	0.6991 (0.0246)	0.8405 (0.0449)	0.9188 (0.0079)	0.9400 (0.0038)	0.9547 (0.0032)
ABD	0.6481 (0.0294)	0.8082 (0.0517)	0.8996 (0.0102)	0.9252 (0.0051)	0.9434 (0.0046)
BNS	0.6471 (0.0301)	0.8073 (0.0520)	0.8991 (0.0101)	0.9248 (0.0050)	0.9430 (0.0047)
CPR	0.5738 (0.0313)	0.7510 (0.0611)	0.8622 (0.0123)	0.8956 (0.0067)	0.9199 (0.0061)
RATIO	0.6201 (0.0290)	0.7658 (0.0514)	0.8547 (0.0091)	0.8794 (0.0060)	0.8952 (0.0033)
LOG	0.6201 (0.0290)	0.7657 (0.0514)	0.8547 (0.0091)	0.8794 (0.0060)	0.8952 (0.0033)
DIFF	0.6058 (0.0289)	0.7544 (0.0539)	0.8476 (0.0096)	0.8735 (0.0057)	0.8907 (0.0037)
BMI					
LM	0.9984 (0.0006)	0.9979 (0.0004)	0.9977 (0.0006)	0.9977 (0.0003)	0.9977 (0.0004)
MED-RATIO	0.9998 (0.0000)	0.9997 (0.0002)	0.9996 (0.0001)	0.9995 (0.0002)	0.9993 (0.0001)
MIN-RATIO	0.9997 (0.0000)	0.9996 (0.0001)	0.9996 (0.0001)	0.9995 (0.0001)	0.9994 (0.0001)
ABD-RATIO	0.9996 (0.0000)	0.9995 (0.0001)	0.9996 (0.0000)	0.9995 (0.0001)	0.9994 (0.0001)
BNS-RATIO	0.9996 (0.0000)	0.9996 (0.0000)	0.9996 (0.0000)	0.9995 (0.0001)	0.9994 (0.0001)
CPR-RATIO	0.9994 (0.0000)	0.9994 (0.0001)	0.9994 (0.0001)	0.9992 (0.0001)	0.9992 (0.0000)
MED	0.9940 (0.0002)	0.9940 (0.0002)	0.9939 (0.0002)	0.9937 (0.0003)	0.9936 (0.0002)
MIN	0.9913 (0.0002)	0.9913 (0.0003)	0.9912 (0.0001)	0.9911 (0.0002)	0.9911 (0.0001)
ABD	0.9887 (0.0001)	0.9888 (0.0003)	0.9889 (0.0003)	0.9889 (0.0002)	0.9889 (0.0002)
BNS	0.9887 (0.0001)	0.9888 (0.0003)	0.9889 (0.0002)	0.9888 (0.0002)	0.9888 (0.0003)
CPR	0.9838 (0.0003)	0.9838 (0.0003)	0.9839 (0.0003)	0.9838 (0.0001)	0.9838 (0.0003)
RATIO	0.9870 (0.0002)	0.9851 (0.0009)	0.9827 (0.0006)	0.9807 (0.0006)	0.9779 (0.0012)
LOG	0.9870 (0.0002)	0.9851 (0.0009)	0.9827 (0.0006)	0.9807 (0.0006)	0.9779 (0.0012)
DIFF	0.9860 (0.0002)	0.9841 (0.0009)	0.9817 (0.0006)	0.9795 (0.0007)	0.9768 (0.0012)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with λ stressed five times per parameter category.

Table 43 Jump detection test performances when λ is stressed under the SVJJ model at the 1-minute sampling frequency.

	λ				
	[1, 3)	**[3, 11)**	**[11, 16)**	**[16, 21.5)**	**[21.5, 30]**
MCC					
LM	0.9820 (0.0022)	0.9899 (0.0033)	0.9948 (0.0012)	0.9962 (0.0005)	0.9970 (0.0005)
MED-RATIO	0.9824 (0.0015)	0.9910 (0.0030)	0.9956 (0.0005)	0.9963 (0.0004)	0.9969 (0.0003)
MIN-RATIO	0.9786 (0.0017)	0.9894 (0.0032)	0.9949 (0.0004)	0.9962 (0.0005)	0.9965 (0.0005)
ABD-RATIO	0.9695 (0.0041)	0.9848 (0.0050)	0.9931 (0.0005)	0.9947 (0.0008)	0.9954 (0.0004)
BNS-RATIO	0.9692 (0.0040)	0.9847 (0.0050)	0.9930 (0.0006)	0.9947 (0.0008)	0.9954 (0.0004)
CPR-RATIO	0.9583 (0.0051)	0.9790 (0.0067)	0.9902 (0.0009)	0.9926 (0.0009)	0.9937 (0.0006)
MED	0.7571 (0.0241)	0.8744 (0.0402)	0.9384 (0.0069)	0.9544 (0.0038)	0.9653 (0.0033)
MIN	0.7058 (0.0244)	0.8478 (0.0454)	0.9232 (0.0056)	0.9432 (0.0052)	0.9567 (0.0040)
ABD	0.6438 (0.0274)	0.8038 (0.0549)	0.8977 (0.0092)	0.9235 (0.0072)	0.9415 (0.0054)
BNS	0.6413 (0.0279)	0.8026 (0.0550)	0.8969 (0.0091)	0.9229 (0.0075)	0.9411 (0.0053)
CPR	0.5816 (0.0292)	0.7590 (0.0618)	0.8684 (0.0118)	0.9009 (0.0082)	0.9234 (0.0067)
RATIO	0.5954 (0.0291)	0.7464 (0.0549)	0.8429 (0.0092)	0.8689 (0.0063)	0.8871 (0.0037)
LOG	0.5954 (0.0291)	0.7464 (0.0548)	0.8429 (0.0092)	0.8688 (0.0063)	0.8871 (0.0037)
DIFF	0.5680 (0.0300)	0.7262 (0.0582)	0.8291 (0.0101)	0.8585 (0.0063)	0.8784 (0.0041)
BMI					
LM	0.9973 (0.0011)	0.9971 (0.0006)	0.9969 (0.0007)	0.9968 (0.0004)	0.9968 (0.0004)
MED-RATIO	0.9997 (0.0000)	0.9994 (0.0004)	0.9994 (0.0001)	0.9990 (0.0002)	0.9989 (0.0002)
MIN-RATIO	0.9996 (0.0000)	0.9994 (0.0002)	0.9994 (0.0001)	0.9992 (0.0002)	0.9991 (0.0001)
ABD-RATIO	0.9994 (0.0001)	0.9993 (0.0002)	0.9993 (0.0000)	0.9992 (0.0001)	0.9991 (0.0001)
BNS-RATIO	0.9994 (0.0001)	0.9994 (0.0000)	0.9993 (0.0000)	0.9993 (0.0001)	0.9992 (0.0001)
CPR-RATIO	0.9992 (0.0001)	0.9991 (0.0001)	0.9991 (0.0000)	0.9990 (0.0001)	0.9988 (0.0001)
MED	0.9936 (0.0002)	0.9934 (0.0004)	0.9934 (0.0003)	0.9930 (0.0001)	0.9929 (0.0003)
MIN	0.9916 (0.0002)	0.9918 (0.0001)	0.9917 (0.0003)	0.9915 (0.0002)	0.9915 (0.0002)
ABD	0.9885 (0.0002)	0.9885 (0.0002)	0.9886 (0.0002)	0.9886 (0.0004)	0.9885 (0.0002)
BNS	0.9883 (0.0002)	0.9885 (0.0002)	0.9886 (0.0002)	0.9885 (0.0004)	0.9885 (0.0002)
CPR	0.9844 (0.0003)	0.9847 (0.0003)	0.9847 (0.0002)	0.9847 (0.0003)	0.9846 (0.0003)
RATIO	0.9853 (0.0004)	0.9833 (0.0009)	0.9810 (0.0006)	0.9787 (0.0004)	0.9759 (0.0013)
LOG	0.9853 (0.0004)	0.9833 (0.0010)	0.9810 (0.0006)	0.9787 (0.0004)	0.9759 (0.0013)
DIFF	0.9833 (0.0003)	0.9812 (0.0010)	0.9788 (0.0007)	0.9766 (0.0005)	0.9737 (0.0013)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with λ stressed five times per parameter category.

Table 44 Jump detection test performances when λ is stressed under the SVJJ model at the 5-minute sampling frequency.

	λ				
	[1, 3)	**[3, 11)**	**[11, 16)**	**[16, 21.5)**	**[21.5, 30]**
MCC					
LM	0.9776 (0.0028)	0.9872 (0.0034)	0.9927 (0.0010)	0.9941 (0.0006)	0.9949 (0.0004)
MED-RATIO	0.9287 (0.0086)	0.9646 (0.0121)	0.9835 (0.0021)	0.9870 (0.0007)	0.9895 (0.0008)
MIN-RATIO	0.9485 (0.0062)	0.9731 (0.0091)	0.9879 (0.0018)	0.9910 (0.0006)	0.9926 (0.0007)
ABD-RATIO	0.9011 (0.0128)	0.9496 (0.0174)	0.9762 (0.0031)	0.9823 (0.0018)	0.9856 (0.0014)
BNS-RATIO	0.8994 (0.0128)	0.9489 (0.0175)	0.9760 (0.0033)	0.9823 (0.0019)	0.9856 (0.0015)
CPR-RATIO	0.8787 (0.0115)	0.9388 (0.0204)	0.9712 (0.0035)	0.9788 (0.0022)	0.9831 (0.0019)
MED	0.7132 (0.0294)	0.8486 (0.0458)	0.9242 (0.0066)	0.9438 (0.0035)	0.9564 (0.0032)
MIN	0.7478 (0.0247)	0.8688 (0.0415)	0.9370 (0.0065)	0.9532 (0.0038)	0.9644 (0.0029)
ABD	0.6225 (0.0331)	0.7835 (0.0590)	0.8845 (0.0110)	0.9143 (0.0066)	0.9329 (0.0051)
BNS	0.6191 (0.0329)	0.7809 (0.0596)	0.8830 (0.0114)	0.9131 (0.0065)	0.9321 (0.0053)
CPR	0.5902 (0.0337)	0.7603 (0.0623)	0.8690 (0.0122)	0.9022 (0.0078)	0.9235 (0.0062)
RATIO	0.4724 (0.0300)	0.6484 (0.0663)	0.7702 (0.0141)	0.8118 (0.0081)	0.8404 (0.0086)
LOG	0.4724 (0.0300)	0.6483 (0.0662)	0.7701 (0.0141)	0.8117 (0.0081)	0.8404 (0.0085)
DIFF	0.4101 (0.0288)	0.5881 (0.0686)	0.7199 (0.0164)	0.7678 (0.0102)	0.8033 (0.0104)
BMI					
LM	0.9944 (0.0014)	0.9933 (0.0012)	0.9930 (0.0009)	0.9929 (0.0006)	0.9928 (0.0003)
MED-RATIO	0.9977 (0.0009)	0.9977 (0.0005)	0.9973 (0.0004)	0.9964 (0.0003)	0.9959 (0.0008)
MIN-RATIO	0.9953 (0.0018)	0.9973 (0.0007)	0.9982 (0.0002)	0.9976 (0.0002)	0.9975 (0.0004)
ABD-RATIO	0.9979 (0.0001)	0.9974 (0.0003)	0.9970 (0.0002)	0.9964 (0.0001)	0.9961 (0.0005)
BNS-RATIO	0.9979 (0.0001)	0.9976 (0.0002)	0.9974 (0.0002)	0.9969 (0.0002)	0.9966 (0.0004)
CPR-RATIO	0.9973 (0.0001)	0.9971 (0.0002)	0.9969 (0.0002)	0.9968 (0.0002)	0.9966 (0.0002)
MED	0.9910 (0.0010)	0.9912 (0.0004)	0.9909 (0.0005)	0.9900 (0.0005)	0.9894 (0.0008)
MIN	0.9896 (0.0018)	0.9917 (0.0007)	0.9928 (0.0002)	0.9922 (0.0002)	0.9921 (0.0003)
ABD	0.9871 (0.0002)	0.9866 (0.0003)	0.9863 (0.0001)	0.9859 (0.0002)	0.9855 (0.0005)
BNS	0.9869 (0.0002)	0.9866 (0.0002)	0.9865 (0.0003)	0.9862 (0.0002)	0.9858 (0.0003)
CPR	0.9849 (0.0002)	0.9847 (0.0002)	0.9846 (0.0003)	0.9847 (0.0003)	0.9843 (0.0002)
RATIO	0.9732 (0.0005)	0.9712 (0.0010)	0.9683 (0.0005)	0.9665 (0.0008)	0.9636 (0.0008)
LOG	0.9732 (0.0005)	0.9711 (0.0010)	0.9683 (0.0005)	0.9664 (0.0008)	0.9636 (0.0008)
DIFF	0.9629 (0.0006)	0.9606 (0.0012)	0.9575 (0.0005)	0.9554 (0.0006)	0.9524 (0.0009)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with λ stressed five times per parameter category.

Table 45 Jump detection test performances when λ is stressed under the SVJJ model at the 15-minute sampling frequency.

	λ				
	[1, 3)	**[3, 11)**	**[11, 16)**	**[16, 21.5)**	**[21.5, 30]**
MCC					
LM	0.9720 (0.0028)	0.9828 (0.0048)	0.9900 (0.0010)	0.9913 (0.0006)	0.9922 (0.0004)
MED-RATIO	0.8281 (0.0222)	0.9113 (0.0283)	0.9568 (0.0040)	0.9659 (0.0019)	0.9719 (0.0007)
MIN-RATIO	0.9109 (0.0072)	0.9484 (0.0140)	0.9709 (0.0020)	0.9731 (0.0011)	0.9705 (0.0029)
ABD-RATIO	0.7938 (0.0207)	0.8910 (0.0338)	0.9449 (0.0047)	0.9568 (0.0012)	0.9631 (0.0008)
BNS-RATIO	0.7876 (0.0214)	0.8876 (0.0349)	0.9437 (0.0048)	0.9568 (0.0013)	0.9646 (0.0014)
CPR-RATIO	0.7854 (0.0212)	0.8862 (0.0354)	0.9426 (0.0049)	0.9558 (0.0018)	0.9631 (0.0015)
MED	0.6745 (0.0338)	0.8230 (0.0508)	0.9087 (0.0092)	0.9298 (0.0048)	0.9446 (0.0031)
MIN	0.7977 (0.0224)	0.8932 (0.0317)	0.9451 (0.0049)	0.9547 (0.0019)	0.9568 (0.0022)
ABD	0.5986 (0.0315)	0.7673 (0.0605)	0.8719 (0.0107)	0.9021 (0.0048)	0.9203 (0.0031)
BNS	0.5901 (0.0317)	0.7610 (0.0622)	0.8690 (0.0109)	0.9005 (0.0049)	0.9205 (0.0038)
CPR	0.5923 (0.0321)	0.7623 (0.0615)	0.8690 (0.0108)	0.9006 (0.0054)	0.9198 (0.0040)
RATIO	0.3454 (0.0278)	0.5180 (0.0690)	0.6590 (0.0188)	0.7132 (0.0113)	0.7590 (0.0127)
LOG	0.3453 (0.0277)	0.5179 (0.0689)	0.6588 (0.0187)	0.7130 (0.0113)	0.7587 (0.0126)
DIFF	0.2813 (0.0243)	0.4394 (0.0651)	0.5776 (0.0204)	0.6365 (0.0131)	0.6888 (0.0145)
BMI					
LM	0.9903 (0.0019)	0.9881 (0.0013)	0.9880 (0.0011)	0.9876 (0.0002)	0.9876 (0.0006)
MED-RATIO	0.9818 (0.0047)	0.9883 (0.0022)	0.9901 (0.0014)	0.9880 (0.0012)	0.9853 (0.0019)
MIN-RATIO	0.9506 (0.0057)	0.9678 (0.0060)	0.9739 (0.0010)	0.9704 (0.0016)	0.9613 (0.0058)
ABD-RATIO	0.9943 (0.0012)	0.9930 (0.0006)	0.9910 (0.0010)	0.9876 (0.0014)	0.9823 (0.0032)
BNS-RATIO	0.9944 (0.0007)	0.9936 (0.0005)	0.9924 (0.0006)	0.9900 (0.0011)	0.9865 (0.0020)
CPR-RATIO	0.9942 (0.0007)	0.9931 (0.0007)	0.9917 (0.0010)	0.9893 (0.0008)	0.9849 (0.0022)
MED	0.9761 (0.0048)	0.9827 (0.0022)	0.9846 (0.0014)	0.9825 (0.0012)	0.9800 (0.0019)
MIN	0.9478 (0.0058)	0.9650 (0.0060)	0.9712 (0.0011)	0.9679 (0.0016)	0.9588 (0.0058)
ABD	0.9850 (0.0011)	0.9839 (0.0006)	0.9820 (0.0010)	0.9788 (0.0015)	0.9735 (0.0034)
BNS	0.9847 (0.0007)	0.9841 (0.0005)	0.9830 (0.0006)	0.9809 (0.0012)	0.9773 (0.0022)
CPR	0.9848 (0.0007)	0.9838 (0.0006)	0.9825 (0.0010)	0.9803 (0.0009)	0.9759 (0.0024)
RATIO	0.9462 (0.0003)	0.9438 (0.0012)	0.9414 (0.0006)	0.9392 (0.0008)	0.9373 (0.0007)
LOG	0.9461 (0.0003)	0.9438 (0.0012)	0.9414 (0.0006)	0.9391 (0.0008)	0.9372 (0.0008)
DIFF	0.9181 (0.0005)	0.9159 (0.0016)	0.9128 (0.0005)	0.9104 (0.0007)	0.9086 (0.0010)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\mu_V = 0.05$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with λ stressed five times per parameter category.

C.5 Volatility jump rate parameter: μ_V

Table 46 Jump detection test performances when μ_V is stressed under the SVJJ model at the 30-second sampling frequency.

	μ_V			
	[0, 0.05)	**[0.05, 0.18)**	**[0.18, 0.37)**	**[0.37, 2]**
MCC				
LM	0.9971 (0.0007)	0.9918 (0.0026)	0.9843 (0.0017)	0.9785 (0.0019)
MED-RATIO	0.9957 (0.0012)	0.9964 (0.0001)	0.9958 (0.0003)	0.9939 (0.0011)
MIN-RATIO	0.9948 (0.0016)	0.9957 (0.0001)	0.9951 (0.0002)	0.9926 (0.0016)
ABD-RATIO	0.9938 (0.0021)	0.9950 (0.0001)	0.9941 (0.0003)	0.9908 (0.0021)
BNS-RATIO	0.9938 (0.0021)	0.9949 (0.0002)	0.9940 (0.0003)	0.9906 (0.0021)
CPR-RATIO	0.9908 (0.0029)	0.9925 (0.0002)	0.9914 (0.0004)	0.9869 (0.0029)
MED	0.9395 (0.0002)	0.9399 (0.0001)	0.9400 (0.0000)	0.9400 (0.0001)
MIN	0.9165 (0.0003)	0.9162 (0.0001)	0.9162 (0.0001)	0.9160 (0.0001)
ABD	0.8965 (0.0006)	0.8974 (0.0001)	0.8975 (0.0001)	0.8974 (0.0001)
BNS	0.8958 (0.0006)	0.8967 (0.0001)	0.8968 (0.0001)	0.8967 (0.0001)
] CPR	0.8599 (0.0006)	0.8605 (0.0001)	0.8605 (0.0001)	0.8602 (0.0001)
RATIO	0.8189 (0.0500)	0.8514 (0.0020)	0.8305 (0.0093)	0.7410 (0.0545)
LOG	0.8189 (0.0500)	0.8514 (0.0020)	0.8305 (0.0093)	0.7410 (0.0545)
DIFF	0.8109 (0.0497)	0.8438 (0.0019)	0.8228 (0.0092)	0.7356 (0.0532)
BMI				
LM	0.9972 (0.0000)	0.9972 (0.0000)	0.9972 (0.0000)	0.9972 (0.0000)
MED-RATIO	0.9994 (0.0001)	0.9995 (0.0000)	0.9995 (0.0000)	0.9993 (0.0001)
MIN-RATIO	0.9994 (0.0002)	0.9995 (0.0000)	0.9994 (0.0000)	0.9992 (0.0002)
ABD-RATIO	0.9994 (0.0002)	0.9995 (0.0000)	0.9995 (0.0000)	0.9992 (0.0002)
BNS-RATIO	0.9994 (0.0002)	0.9995 (0.0000)	0.9995 (0.0000)	0.9992 (0.0002)
CPR-RATIO	0.9991 (0.0003)	0.9993 (0.0000)	0.9992 (0.0000)	0.9988 (0.0003)
MED	0.9937 (0.0000)	0.9937 (0.0000)	0.9937 (0.0000)	0.9937 (0.0000)
MIN	0.9911 (0.0000)	0.9911 (0.0000)	0.9911 (0.0000)	0.9910 (0.0001)
ABD	0.9887 (0.0001)	0.9888 (0.0000)	0.9888 (0.0000)	0.9888 (0.0000)
BNS	0.9886 (0.0001)	0.9887 (0.0000)	0.9888 (0.0000)	0.9888 (0.0000)
CPR	0.9838 (0.0001)	0.9839 (0.0000)	0.9839 (0.0000)	0.9839 (0.0000)
RATIO	0.9766 (0.0101)	0.9826 (0.0004)	0.9786 (0.0018)	0.9556 (0.0161)
LOG	0.9766 (0.0101)	0.9826 (0.0004)	0.9786 (0.0018)	0.9555 (0.0161)
DIFF	0.9753 (0.0103)	0.9814 (0.0004)	0.9774 (0.0018)	0.9546 (0.0159)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_V stressed five times per parameter category.

Table 47 Jump detection test performances when μ_V is stressed under the SVJJ model at the 1-minute sampling frequency.

	μ_V			
	[0, 0.05)	**[0.05, 0.18)**	**[0.18, 0.37)**	**[0.37, 2]**
MCC				
LM	0.9968 (0.0006)	0.9927 (0.0017)	0.9876 (0.0011)	0.9824 (0.0022)
MED-RATIO	0.9943 (0.0014)	0.9951 (0.0001)	0.9949 (0.0001)	0.9935 (0.0010)
MIN-RATIO	0.9943 (0.0015)	0.9949 (0.0001)	0.9945 (0.0002)	0.9917 (0.0020)
ABD-RATIO	0.9917 (0.0023)	0.9929 (0.0002)	0.9920 (0.0003)	0.9885 (0.0022)
BNS-RATIO	0.9917 (0.0024)	0.9928 (0.0002)	0.9920 (0.0002)	0.9885 (0.0021)
CPR-RATIO	0.9886 (0.0031)	0.9903 (0.0004)	0.9887 (0.0004)	0.9843 (0.0026)
MED	0.9398 (0.0003)	0.9399 (0.0001)	0.9400 (0.0001)	0.9402 (0.0001)
MIN	0.9229 (0.0004)	0.9229 (0.0002)	0.9226 (0.0001)	0.9220 (0.0007)
ABD	0.8961 (0.0003)	0.8955 (0.0001)	0.8957 (0.0000)	0.8955 (0.0003)
BNS	0.8952 (0.0003)	0.8948 (0.0001)	0.8948 (0.0001)	0.8948 (0.0002)
CPR	0.8678 (0.0004)	0.8675 (0.0001)	0.8673 (0.0001)	0.8671 (0.0002)
RATIO	0.8103 (0.0503)	0.8412 (0.0031)	0.8192 (0.0086)	0.7332 (0.0521)
LOG	0.8103 (0.0503)	0.8412 (0.0031)	0.8191 (0.0086)	0.7332 (0.0521)
DIFF	0.7950 (0.0491)	0.8268 (0.0027)	0.8060 (0.0084)	0.7238 (0.0494)
BMI				
LM	0.9967 (0.0000)	0.9967 (0.0000)	0.9967 (0.0000)	0.9967 (0.0000)
MED-RATIO	0.9993 (0.0001)	0.9994 (0.0000)	0.9994 (0.0000)	0.9989 (0.0005)
MIN-RATIO	0.9993 (0.0001)	0.9992 (0.0000)	0.9992 (0.0000)	0.9984 (0.0008)
ABD-RATIO	0.9992 (0.0002)	0.9993 (0.0000)	0.9993 (0.0000)	0.9987 (0.0005)
BNS-RATIO	0.9992 (0.0002)	0.9993 (0.0000)	0.9993 (0.0000)	0.9988 (0.0004)
CPR-RATIO	0.9989 (0.0003)	0.9991 (0.0000)	0.9990 (0.0000)	0.9985 (0.0003)
MED	0.9937 (0.0000)	0.9937 (0.0000)	0.9937 (0.0000)	0.9934 (0.0004)
MIN	0.9918 (0.0001)	0.9917 (0.0000)	0.9917 (0.0000)	0.9911 (0.0007)
ABD	0.9887 (0.0000)	0.9887 (0.0000)	0.9887 (0.0000)	0.9885 (0.0004)
BNS	0.9886 (0.0000)	0.9886 (0.0000)	0.9886 (0.0000)	0.9885 (0.0002)
CPR	0.9850 (0.0000)	0.9850 (0.0000)	0.9850 (0.0000)	0.9849 (0.0001)
RATIO	0.9752 (0.0103)	0.9811 (0.0006)	0.9769 (0.0017)	0.9541 (0.0158)
LOG	0.9752 (0.0103)	0.9811 (0.0006)	0.9769 (0.0017)	0.9541 (0.0158)
DIFF	0.9727 (0.0105)	0.9789 (0.0005)	0.9748 (0.0017)	0.9523 (0.0155)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_V stressed five times per parameter category.

Table 48 Jump detection test performances when μ_V is stressed under the SVJJ model at the 5-minute sampling frequency.

	μ_V			
	[0, 0.05)	**[0.05, 0.18)**	**[0.18, 0.37)**	**[0.37, 2]**
MCC				
LM	0.9941 (0.0005)	0.9905 (0.0014)	0.9862 (0.0009)	0.9804 (0.0034)
MED-RATIO	0.9825 (0.0025)	0.9836 (0.0002)	0.9823 (0.0006)	0.9752 (0.0048)
MIN-RATIO	0.9869 (0.0024)	0.9877 (0.0004)	0.9857 (0.0008)	0.9741 (0.0070)
ABD-RATIO	0.9716 (0.0047)	0.9750 (0.0002)	0.9735 (0.0007)	0.9633 (0.0063)
BNS-RATIO	0.9715 (0.0046)	0.9748 (0.0002)	0.9735 (0.0005)	0.9639 (0.0062)
CPR-RATIO	0.9664 (0.0053)	0.9700 (0.0003)	0.9685 (0.0004)	0.9610 (0.0049)
MED	0.9233 (0.0002)	0.9226 (0.0002)	0.9220 (0.0004)	0.9168 (0.0036)
MIN	0.9353 (0.0006)	0.9349 (0.0004)	0.9332 (0.0006)	0.9236 (0.0060)
ABD	0.8816 (0.0006)	0.8820 (0.0004)	0.8810 (0.0004)	0.8740 (0.0045)
BNS	0.8805 (0.0004)	0.8805 (0.0004)	0.8795 (0.0002)	0.8734 (0.0043)
CPR	0.8662 (0.0003)	0.8662 (0.0001)	0.8658 (0.0001)	0.8622 (0.0028)
RATIO	0.7392 (0.0425)	0.7668 (0.0023)	0.7511 (0.0063)	0.6883 (0.0380)
LOG	0.7391 (0.0425)	0.7668 (0.0022)	0.7510 (0.0063)	0.6881 (0.0380)
DIFF	0.6892 (0.0392)	0.7168 (0.0014)	0.7038 (0.0054)	0.6520 (0.0314)
BMI				
LM	0.9927 (0.0000)	0.9927 (0.0000)	0.9927 (0.0000)	0.9884 (0.0042)
MED-RATIO	0.9970 (0.0002)	0.9969 (0.0001)	0.9960 (0.0005)	0.9858 (0.0077)
MIN-RATIO	0.9983 (0.0002)	0.9977 (0.0004)	0.9952 (0.0012)	0.9771 (0.0113)
ABD-RATIO	0.9963 (0.0006)	0.9970 (0.0001)	0.9962 (0.0005)	0.9832 (0.0089)
BNS-RATIO	0.9969 (0.0005)	0.9975 (0.0001)	0.9968 (0.0003)	0.9850 (0.0086)
CPR-RATIO	0.9966 (0.0006)	0.9971 (0.0000)	0.9968 (0.0002)	0.9887 (0.0064)
MED	0.9907 (0.0001)	0.9904 (0.0001)	0.9896 (0.0004)	0.9802 (0.0070)
MIN	0.9929 (0.0000)	0.9922 (0.0005)	0.9897 (0.0011)	0.9721 (0.0109)
ABD	0.9859 (0.0002)	0.9863 (0.0001)	0.9856 (0.0004)	0.9735 (0.0083)
BNS	0.9865 (0.0001)	0.9867 (0.0001)	0.9860 (0.0002)	0.9751 (0.0080)
CPR	0.9847 (0.0001)	0.9848 (0.0001)	0.9846 (0.0002)	0.9778 (0.0055)
RATIO	0.9619 (0.0108)	0.9684 (0.0005)	0.9647 (0.0015)	0.9426 (0.0157)
LOG	0.9619 (0.0108)	0.9684 (0.0005)	0.9647 (0.0016)	0.9425 (0.0157)
DIFF	0.9502 (0.0119)	0.9579 (0.0004)	0.9542 (0.0016)	0.9341 (0.0141)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_V stressed five times per parameter category.

Table 49 Jump detection test performances when μ_V is stressed under the SVJJ model at the 15-minute sampling frequency.

	μ_V			
	[0, 0.05)	**[0.05, 0.18)**	**[0.18, 0.37)**	**[0.37, 2]**
MCC				
LM	0.9913 (0.0005)	0.9876 (0.0017)	0.9801 (0.0029)	0.9605 (0.0093)
MED-RATIO	0.9551 (0.0032)	0.9548 (0.0020)	0.9425 (0.0048)	0.9194 (0.0093)
MIN-RATIO	0.9743 (0.0014)	0.9629 (0.0070)	0.9316 (0.0087)	0.9020 (0.0092)
ABD-RATIO	0.9402 (0.0036)	0.9405 (0.0033)	0.9225 (0.0063)	0.8982 (0.0084)
BNS-RATIO	0.9393 (0.0037)	0.9405 (0.0026)	0.9244 (0.0058)	0.8997 (0.0088)
CPR-RATIO	0.9377 (0.0038)	0.9390 (0.0027)	0.9238 (0.0052)	0.9011 (0.0084)
MED	0.9072 (0.0002)	0.9054 (0.0019)	0.8937 (0.0046)	0.8729 (0.0082)
MIN	0.9490 (0.0030)	0.9346 (0.0076)	0.9022 (0.0087)	0.8731 (0.0089)
ABD	0.8680 (0.0007)	0.8642 (0.0035)	0.8465 (0.0060)	0.8245 (0.0072)
BNS	0.8654 (0.0009)	0.8624 (0.0026)	0.8469 (0.0057)	0.8245 (0.0076)
CPR	0.8650 (0.0007)	0.8620 (0.0029)	0.8473 (0.0048)	0.8271 (0.0071)
RATIO	0.6326 (0.0289)	0.6531 (0.0014)	0.6426 (0.0042)	0.6090 (0.0175)
LOG	0.6325 (0.0288)	0.6529 (0.0013)	0.6423 (0.0041)	0.6085 (0.0176)
DIFF	0.5544 (0.0244)	0.5715 (0.0009)	0.5642 (0.0029)	0.5395 (0.0127)
BMI				
LM	0.9876 (0.0000)	0.9874 (0.0003)	0.9809 (0.0036)	0.9497 (0.0158)
MED-RATIO	0.9911 (0.0002)	0.9868 (0.0035)	0.9662 (0.0079)	0.9254 (0.0169)
MIN-RATIO	0.9847 (0.0045)	0.9612 (0.0126)	0.9061 (0.0150)	0.8550 (0.0157)
ABD-RATIO	0.9902 (0.0006)	0.9845 (0.0060)	0.9543 (0.0103)	0.9135 (0.0146)
BNS-RATIO	0.9919 (0.0004)	0.9878 (0.0047)	0.9606 (0.0096)	0.9192 (0.0153)
CPR-RATIO	0.9909 (0.0006)	0.9868 (0.0047)	0.9613 (0.0084)	0.9229 (0.0146)
MED	0.9857 (0.0003)	0.9813 (0.0034)	0.9612 (0.0077)	0.9221 (0.0162)
MIN	0.9822 (0.0046)	0.9584 (0.0126)	0.9034 (0.0150)	0.8527 (0.0156)
ABD	0.9813 (0.0001)	0.9752 (0.0060)	0.9453 (0.0101)	0.9056 (0.0141)
BNS	0.9827 (0.0001)	0.9782 (0.0046)	0.9514 (0.0094)	0.9111 (0.0148)
CPR	0.9819 (0.0001)	0.9773 (0.0047)	0.9522 (0.0082)	0.9152 (0.0142)
RATIO	0.9343 (0.0104)	0.9412 (0.0007)	0.9345 (0.0030)	0.9057 (0.0157)
LOG	0.9343 (0.0104)	0.9411 (0.0007)	0.9343 (0.0030)	0.9053 (0.0158)
DIFF	0.9047 (0.0120)	0.9126 (0.0005)	0.9074 (0.0024)	0.8828 (0.0139)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\rho_J = -0.38$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with μ_V stressed five times per parameter category.

C.6 Jump correlation parameter: ρ_J

Table 50 Jump detection test performances when ρ_J is stressed under the SVJJ model at the 30-second sampling frequency.

	ρ_J					
	[-1, -0.95)	**[-0.95, 0.07)**	**[0.07, 0.3)**	**[0.3, 0.4)**	**[0.4, 0.75)**	**[0.75, 1]**
MCC						
LM	0.9961 (0.0000)	0.9949 (0.0008)	0.9896 (0.0022)	0.9795 (0.0020)	0.9695 (0.0032)	0.9615 (0.0003)
MED-RATIO	0.9960 (0.0000)	0.9964 (0.0002)	0.9967 (0.0003)	0.9930 (0.0012)	0.9831 (0.0046)	0.9687 (0.0018)
MIN-RATIO	0.9954 (0.0000)	0.9958 (0.0002)	0.9960 (0.0003)	0.9916 (0.0017)	0.9806 (0.0054)	0.9644 (0.0021)
ABD-RATIO	0.9944 (0.0000)	0.9951 (0.0004)	0.9956 (0.0003)	0.9919 (0.0014)	0.9823 (0.0045)	0.9683 (0.0019)
BNS-RATIO	0.9943 (0.0000)	0.9950 (0.0004)	0.9956 (0.0003)	0.9918 (0.0014)	0.9823 (0.0045)	0.9685 (0.0019)
CPR-RATIO	0.9920 (0.0000)	0.9926 (0.0004)	0.9934 (0.0001)	0.9902 (0.0012)	0.9818 (0.0040)	0.9696 (0.0015)
MED	0.9398 (0.0000)	0.9398 (0.0001)	0.9396 (0.0003)	0.9358 (0.0014)	0.9255 (0.0047)	0.9107 (0.0020)
MIN	0.9167 (0.0000)	0.9163 (0.0002)	0.9161 (0.0004)	0.9113 (0.0017)	0.9000 (0.0054)	0.8830 (0.0023)
ABD	0.8971 (0.0000)	0.8973 (0.0001)	0.8971 (0.0003)	0.8933 (0.0014)	0.8835 (0.0045)	0.8690 (0.0020)
BNS	0.8966 (0.0000)	0.8966 (0.0001)	0.8963 (0.0003)	0.8924 (0.0014)	0.8827 (0.0045)	0.8684 (0.0021)
CPR	0.8606 (0.0000)	0.8604 (0.0001)	0.8603 (0.0002)	0.8568 (0.0013)	0.8479 (0.0042)	0.8351 (0.0017)
RATIO	0.8354 (0.0004)	0.8509 (0.0078)	0.8670 (0.0015)	0.8691 (0.0005)	0.8659 (0.0014)	0.8611 (0.0005)
LOG	0.8353 (0.0004)	0.8508 (0.0078)	0.8670 (0.0015)	0.8691 (0.0005)	0.8659 (0.0015)	0.8611 (0.0005)
DIFF	0.8278 (0.0003)	0.8435 (0.0076)	0.8592 (0.0015)	0.8612 (0.0007)	0.8580 (0.0014)	0.8538 (0.0006)
BMI						
LM	0.9972 (0.0000)	0.9972 (0.0000)	0.9971 (0.0002)	0.9944 (0.0011)	0.9861 (0.0042)	0.9720 (0.0018)
MED-RATIO	0.9995 (0.0000)	0.9995 (0.0000)	0.9993 (0.0005)	0.9923 (0.0024)	0.9740 (0.0085)	0.9472 (0.0033)
MIN-RATIO	0.9995 (0.0000)	0.9995 (0.0000)	0.9992 (0.0006)	0.9910 (0.0030)	0.9707 (0.0099)	0.9407 (0.0038)
ABD-RATIO	0.9995 (0.0000)	0.9995 (0.0000)	0.9993 (0.0005)	0.9924 (0.0026)	0.9747 (0.0084)	0.9484 (0.0035)
BNS-RATIO	0.9995 (0.0000)	0.9995 (0.0000)	0.9993 (0.0005)	0.9924 (0.0025)	0.9747 (0.0084)	0.9488 (0.0036)
CPR-RATIO	0.9993 (0.0000)	0.9993 (0.0000)	0.9992 (0.0004)	0.9931 (0.0023)	0.9772 (0.0076)	0.9539 (0.0028)
MED	0.9937 (0.0000)	0.9937 (0.0000)	0.9934 (0.0005)	0.9867 (0.0023)	0.9686 (0.0083)	0.9426 (0.0034)
MIN	0.9911 (0.0000)	0.9911 (0.0000)	0.9908 (0.0006)	0.9826 (0.0030)	0.9627 (0.0096)	0.9332 (0.0038)
ABD	0.9888 (0.0000)	0.9888 (0.0000)	0.9886 (0.0005)	0.9819 (0.0025)	0.9647 (0.0080)	0.9392 (0.0036)
BNS	0.9887 (0.0000)	0.9887 (0.0000)	0.9885 (0.0005)	0.9818 (0.0025)	0.9648 (0.0080)	0.9397 (0.0036)
CPR	0.9839 (0.0000)	0.9839 (0.0000)	0.9837 (0.0003)	0.9779 (0.0022)	0.9630 (0.0071)	0.9412 (0.0029)
RATIO	0.9800 (0.0001)	0.9825 (0.0012)	0.9848 (0.0002)	0.9804 (0.0020)	0.9678 (0.0058)	0.9492 (0.0016)
LOG	0.9800 (0.0001)	0.9825 (0.0012)	0.9848 (0.0002)	0.9804 (0.0020)	0.9678 (0.0058)	0.9492 (0.0016)
DIFF	0.9789 (0.0001)	0.9814 (0.0012)	0.9837 (0.0002)	0.9794 (0.0020)	0.9670 (0.0057)	0.9487 (0.0016)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with ρ_J stressed five times per parameter category.

Table 51 Jump detection test performances when ρ_J is stressed under the SVJJ model at the 1-minute sampling frequency.

	ρ_J					
	[-1, -0.95)	**[-0.95, 0.07)**	**[0.07, 0.3)**	**[0.3, 0.4)**	**[0.4, 0.75)**	**[0.75, 1]**
MCC						
LM	0.9960 (0.0000)	0.9947 (0.0010)	0.9894 (0.0016)	0.9816 (0.0022)	0.9704 (0.0041)	0.9593 (0.0012)
MED-RATIO	0.9949 (0.0000)	0.9951 (0.0001)	0.9953 (0.0003)	0.9905 (0.0018)	0.9787 (0.0058)	0.9610 (0.0022)
MIN-RATIO	0.9948 (0.0001)	0.9951 (0.0001)	0.9952 (0.0005)	0.9896 (0.0020)	0.9759 (0.0067)	0.9557 (0.0029)
ABD-RATIO	0.9924 (0.0001)	0.9930 (0.0003)	0.9934 (0.0003)	0.9888 (0.0019)	0.9767 (0.0060)	0.9590 (0.0025)
BNS-RATIO	0.9923 (0.0001)	0.9930 (0.0003)	0.9934 (0.0003)	0.9888 (0.0018)	0.9767 (0.0060)	0.9593 (0.0025)
CPR-RATIO	0.9896 (0.0001)	0.9906 (0.0004)	0.9911 (0.0002)	0.9870 (0.0015)	0.9760 (0.0054)	0.9600 (0.0021)
MED	0.9397 (0.0000)	0.9398 (0.0001)	0.9398 (0.0003)	0.9351 (0.0018)	0.9227 (0.0061)	0.9047 (0.0022)
MIN	0.9230 (0.0000)	0.9231 (0.0001)	0.9228 (0.0005)	0.9168 (0.0021)	0.9028 (0.0068)	0.8817 (0.0032)
ABD	0.8957 (0.0000)	0.8955 (0.0001)	0.8953 (0.0004)	0.8904 (0.0019)	0.8784 (0.0061)	0.8602 (0.0026)
BNS	0.8948 (0.0000)	0.8947 (0.0001)	0.8945 (0.0004)	0.8896 (0.0018)	0.8777 (0.0063)	0.8597 (0.0027)
CPR	0.8678 (0.0000)	0.8675 (0.0002)	0.8673 (0.0003)	0.8628 (0.0015)	0.8521 (0.0054)	0.8362 (0.0024)
RATIO	0.8256 (0.0004)	0.8419 (0.0081)	0.8564 (0.0011)	0.8565 (0.0011)	0.8498 (0.0028)	0.8401 (0.0009)
LOG	0.8256 (0.0004)	0.8419 (0.0081)	0.8564 (0.0011)	0.8564 (0.0011)	0.8498 (0.0029)	0.8401 (0.0009)
DIFF	0.8117 (0.0004)	0.8272 (0.0079)	0.8421 (0.0014)	0.8431 (0.0010)	0.8372 (0.0026)	0.8283 (0.0010)
BMI						
LM	0.9967 (0.0000)	0.9967 (0.0000)	0.9966 (0.0002)	0.9929 (0.0016)	0.9812 (0.0058)	0.9610 (0.0029)
MED-RATIO	0.9994 (0.0000)	0.9994 (0.0000)	0.9991 (0.0007)	0.9900 (0.0033)	0.9678 (0.0107)	0.9351 (0.0041)
MIN-RATIO	0.9992 (0.0000)	0.9992 (0.0000)	0.9988 (0.0009)	0.9882 (0.0037)	0.9631 (0.0122)	0.9268 (0.0053)
ABD-RATIO	0.9993 (0.0000)	0.9994 (0.0000)	0.9991 (0.0006)	0.9902 (0.0035)	0.9679 (0.0109)	0.9355 (0.0046)
BNS-RATIO	0.9993 (0.0000)	0.9994 (0.0000)	0.9991 (0.0006)	0.9904 (0.0034)	0.9680 (0.0110)	0.9360 (0.0046)
CPR-RATIO	0.9990 (0.0000)	0.9991 (0.0000)	0.9989 (0.0005)	0.9911 (0.0029)	0.9710 (0.0097)	0.9419 (0.0039)
MED	0.9937 (0.0000)	0.9937 (0.0000)	0.9934 (0.0007)	0.9845 (0.0032)	0.9629 (0.0107)	0.9310 (0.0040)
MIN	0.9917 (0.0000)	0.9917 (0.0000)	0.9912 (0.0009)	0.9808 (0.0037)	0.9565 (0.0119)	0.9205 (0.0054)
ABD	0.9887 (0.0000)	0.9887 (0.0000)	0.9884 (0.0006)	0.9797 (0.0034)	0.9586 (0.0107)	0.9270 (0.0046)
BNS	0.9886 (0.0000)	0.9886 (0.0000)	0.9882 (0.0006)	0.9798 (0.0033)	0.9586 (0.0108)	0.9274 (0.0046)
CPR	0.9850 (0.0000)	0.9850 (0.0000)	0.9847 (0.0005)	0.9774 (0.0026)	0.9588 (0.0093)	0.9310 (0.0041)
RATIO	0.9786 (0.0001)	0.9812 (0.0013)	0.9832 (0.0003)	0.9772 (0.0024)	0.9610 (0.0077)	0.9363 (0.0028)
LOG	0.9786 (0.0001)	0.9812 (0.0013)	0.9832 (0.0003)	0.9772 (0.0024)	0.9610 (0.0077)	0.9363 (0.0028)
DIFF	0.9763 (0.0001)	0.9790 (0.0013)	0.9812 (0.0002)	0.9755 (0.0025)	0.9599 (0.0074)	0.9357 (0.0027)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with ρ_J stressed five times per parameter category.

Table 52 Jump detection test performances when ρ_J is stressed under the SVJJ model at the 5-minute sampling frequency.

	ρ_J					
	[-1, -0.95)	**[-0.95, 0.07)**	**[0.07, 0.3)**	**[0.3, 0.4)**	**[0.4, 0.75)**	**[0.75, 1]**
MCC						
LM	0.9933 (0.0000)	0.9923 (0.0008)	0.9887 (0.0013)	0.9793 (0.0026)	0.9624 (0.0078)	0.9388 (0.0034)
MED-RATIO	0.9836 (0.0000)	0.9838 (0.0001)	0.9835 (0.0011)	0.9729 (0.0034)	0.9513 (0.0108)	0.9210 (0.0045)
MIN-RATIO	0.9877 (0.0000)	0.9881 (0.0002)	0.9873 (0.0015)	0.9743 (0.0043)	0.9490 (0.0127)	0.9138 (0.0056)
ABD-RATIO	0.9740 (0.0001)	0.9750 (0.0004)	0.9751 (0.0010)	0.9639 (0.0034)	0.9418 (0.0112)	0.9096 (0.0053)
BNS-RATIO	0.9738 (0.0001)	0.9748 (0.0004)	0.9748 (0.0009)	0.9643 (0.0034)	0.9428 (0.0108)	0.9115 (0.0051)
CPR-RATIO	0.9686 (0.0001)	0.9701 (0.0006)	0.9704 (0.0008)	0.9611 (0.0030)	0.9412 (0.0096)	0.9129 (0.0042)
MED	0.9235 (0.0001)	0.9229 (0.0003)	0.9219 (0.0010)	0.9116 (0.0035)	0.8891 (0.0111)	0.8577 (0.0046)
MIN	0.9356 (0.0001)	0.9355 (0.0002)	0.9339 (0.0016)	0.9206 (0.0043)	0.8949 (0.0129)	0.8583 (0.0062)
ABD	0.8821 (0.0000)	0.8824 (0.0002)	0.8815 (0.0011)	0.8698 (0.0036)	0.8469 (0.0116)	0.8131 (0.0053)
BNS	0.8808 (0.0000)	0.8810 (0.0002)	0.8800 (0.0011)	0.8685 (0.0036)	0.8464 (0.0111)	0.8134 (0.0052)
CPR	0.8659 (0.0000)	0.8663 (0.0002)	0.8662 (0.0009)	0.8564 (0.0031)	0.8361 (0.0099)	0.8067 (0.0044)
RATIO	0.7531 (0.0004)	0.7671 (0.0069)	0.7789 (0.0005)	0.7743 (0.0022)	0.7593 (0.0078)	0.7387 (0.0022)
LOG	0.7530 (0.0004)	0.7670 (0.0069)	0.7789 (0.0005)	0.7742 (0.0022)	0.7594 (0.0077)	0.7387 (0.0022)
DIFF	0.7035 (0.0004)	0.7160 (0.0060)	0.7283 (0.0008)	0.7246 (0.0020)	0.7107 (0.0071)	0.6913 (0.0017)
BMI						
LM	0.9927 (0.0000)	0.9927 (0.0000)	0.9923 (0.0005)	0.9833 (0.0035)	0.9574 (0.0132)	0.9164 (0.0065)
MED-RATIO	0.9970 (0.0000)	0.9970 (0.0000)	0.9959 (0.0019)	0.9768 (0.0063)	0.9374 (0.0194)	0.8835 (0.0081)
MIN-RATIO	0.9983 (0.0000)	0.9983 (0.0000)	0.9965 (0.0028)	0.9722 (0.0079)	0.9268 (0.0226)	0.8645 (0.0100)
ABD-RATIO	0.9970 (0.0000)	0.9969 (0.0001)	0.9957 (0.0021)	0.9749 (0.0063)	0.9350 (0.0201)	0.8777 (0.0093)
BNS-RATIO	0.9975 (0.0000)	0.9974 (0.0001)	0.9963 (0.0019)	0.9764 (0.0063)	0.9374 (0.0196)	0.8813 (0.0090)
CPR-RATIO	0.9969 (0.0000)	0.9970 (0.0000)	0.9961 (0.0016)	0.9788 (0.0055)	0.9425 (0.0175)	0.8918 (0.0076)
MED	0.9906 (0.0000)	0.9905 (0.0000)	0.9894 (0.0018)	0.9710 (0.0060)	0.9328 (0.0189)	0.8799 (0.0078)
MIN	0.9928 (0.0000)	0.9928 (0.0000)	0.9909 (0.0028)	0.9671 (0.0078)	0.9224 (0.0222)	0.8608 (0.0100)
ABD	0.9865 (0.0000)	0.9863 (0.0001)	0.9850 (0.0020)	0.9648 (0.0061)	0.9263 (0.0194)	0.8703 (0.0087)
BNS	0.9868 (0.0000)	0.9867 (0.0001)	0.9854 (0.0018)	0.9661 (0.0061)	0.9285 (0.0187)	0.8736 (0.0084)
CPR	0.9847 (0.0000)	0.9847 (0.0000)	0.9838 (0.0015)	0.9674 (0.0053)	0.9332 (0.0166)	0.8847 (0.0072)
RATIO	0.9656 (0.0001)	0.9685 (0.0014)	0.9703 (0.0011)	0.9571 (0.0043)	0.9278 (0.0149)	0.8864 (0.0050)
LOG	0.9656 (0.0001)	0.9685 (0.0014)	0.9703 (0.0010)	0.9571 (0.0043)	0.9278 (0.0150)	0.8864 (0.0050)
DIFF	0.9546 (0.0001)	0.9577 (0.0015)	0.9602 (0.0008)	0.9482 (0.0041)	0.9209 (0.0138)	0.8818 (0.0043)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with ρ_J stressed five times per parameter category.

Table 53 Jump detection test performances when ρ_J is stressed under the SVJJ model at the 15-minute sampling frequency.

	ρ_J					
	[-1, -0.95)	**[-0.95, 0.07)**	**[0.07, 0.3)**	**[0.3, 0.4)**	**[0.4, 0.75)**	**[0.75, 1]**
MCC						
LM	0.9908 (0.0000)	0.9897 (0.0008)	0.9855 (0.0020)	0.9702 (0.0043)	0.9444 (0.0128)	0.9081 (0.0045)
MED-RATIO	0.9561 (0.0000)	0.9566 (0.0003)	0.9518 (0.0049)	0.9278 (0.0051)	0.8933 (0.0184)	0.8461 (0.0065)
MIN-RATIO	0.9716 (0.0000)	0.9699 (0.0014)	0.9545 (0.0089)	0.9197 (0.0061)	0.8789 (0.0213)	0.8244 (0.0080)
ABD-RATIO	0.9418 (0.0000)	0.9428 (0.0004)	0.9371 (0.0057)	0.9097 (0.0059)	0.8724 (0.0187)	0.8237 (0.0060)
BNS-RATIO	0.9411 (0.0000)	0.9422 (0.0005)	0.9382 (0.0051)	0.9123 (0.0057)	0.8755 (0.0185)	0.8269 (0.0059)
CPR-RATIO	0.9394 (0.0000)	0.9408 (0.0005)	0.9362 (0.0050)	0.9109 (0.0057)	0.8751 (0.0183)	0.8280 (0.0059)
MED	0.9070 (0.0000)	0.9070 (0.0003)	0.9015 (0.0051)	0.8775 (0.0052)	0.8425 (0.0183)	0.7941 (0.0065)
MIN	0.9450 (0.0001)	0.9424 (0.0018)	0.9254 (0.0091)	0.8899 (0.0064)	0.8482 (0.0216)	0.7923 (0.0082)
ABD	0.8677 (0.0000)	0.8672 (0.0004)	0.8594 (0.0060)	0.8311 (0.0062)	0.7933 (0.0188)	0.7436 (0.0061)
BNS	0.8654 (0.0000)	0.8647 (0.0005)	0.8585 (0.0053)	0.8320 (0.0061)	0.7947 (0.0187)	0.7452 (0.0061)
CPR	0.8647 (0.0000)	0.8644 (0.0003)	0.8578 (0.0051)	0.8323 (0.0061)	0.7961 (0.0184)	0.7480 (0.0059)
RATIO	0.6437 (0.0002)	0.6526 (0.0044)	0.6600 (0.0012)	0.6475 (0.0032)	0.6254 (0.0118)	0.5928 (0.0041)
LOG	0.6435 (0.0003)	0.6524 (0.0044)	0.6598 (0.0012)	0.6473 (0.0032)	0.6253 (0.0118)	0.5927 (0.0042)
DIFF	0.5631 (0.0002)	0.5710 (0.0039)	0.5771 (0.0011)	0.5670 (0.0031)	0.5479 (0.0099)	0.5198 (0.0037)
BMI						
LM	0.9876 (0.0000)	0.9876 (0.0000)	0.9862 (0.0023)	0.9653 (0.0064)	0.9217 (0.0227)	0.8562 (0.0090)
MED-RATIO	0.9905 (0.0000)	0.9901 (0.0004)	0.9798 (0.0089)	0.9369 (0.0089)	0.8771 (0.0313)	0.7976 (0.0104)
MIN-RATIO	0.9785 (0.0001)	0.9740 (0.0030)	0.9456 (0.0157)	0.8844 (0.0107)	0.8155 (0.0352)	0.7271 (0.0126)
ABD-RATIO	0.9907 (0.0000)	0.9898 (0.0006)	0.9765 (0.0101)	0.9280 (0.0102)	0.8651 (0.0314)	0.7838 (0.0099)
BNS-RATIO	0.9924 (0.0000)	0.9918 (0.0004)	0.9813 (0.0091)	0.9355 (0.0099)	0.8731 (0.0312)	0.7918 (0.0097)
CPR-RATIO	0.9913 (0.0000)	0.9908 (0.0004)	0.9798 (0.0088)	0.9352 (0.0099)	0.8743 (0.0309)	0.7951 (0.0097)
MED	0.9849 (0.0000)	0.9845 (0.0004)	0.9745 (0.0089)	0.9330 (0.0088)	0.8739 (0.0305)	0.7958 (0.0101)
MIN	0.9759 (0.0001)	0.9713 (0.0031)	0.9430 (0.0156)	0.8822 (0.0107)	0.8139 (0.0348)	0.7259 (0.0126)
ABD	0.9816 (0.0000)	0.9806 (0.0007)	0.9672 (0.0100)	0.9200 (0.0103)	0.8580 (0.0305)	0.7786 (0.0093)
BNS	0.9830 (0.0000)	0.9823 (0.0005)	0.9716 (0.0090)	0.9271 (0.0100)	0.8656 (0.0303)	0.7863 (0.0092)
CPR	0.9821 (0.0000)	0.9814 (0.0005)	0.9704 (0.0086)	0.9273 (0.0101)	0.8677 (0.0300)	0.7905 (0.0090)
RATIO	0.9384 (0.0001)	0.9412 (0.0014)	0.9412 (0.0032)	0.9159 (0.0061)	0.8749 (0.0217)	0.8147 (0.0079)
LOG	0.9383 (0.0001)	0.9411 (0.0013)	0.9411 (0.0032)	0.9158 (0.0061)	0.8748 (0.0217)	0.8146 (0.0079)
DIFF	0.9090 (0.0001)	0.9124 (0.0017)	0.9136 (0.0028)	0.8924 (0.0060)	0.8559 (0.0189)	0.8021 (0.0071)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.14$, $\sigma_S = 0.0001$, $\mu_S = -0.0865$, $\lambda = 12$, $\mu_V = 0.05$, $\kappa = 3.46$, $\theta = 0.008$, $\sqrt{V_0} = 0.087$ and $\rho = -0.82$ with ρ_J stressed five times per parameter category.

Appendix D

Merton model: tabulated results

At each sampling frequency, the stress ranges of the variable parameters under the Merton model, which are stressed one-at-a-time, are each divided into a number of parameter categories. The categories are chosen such that every jump detection test produces similar absolute and relative performances across the parameter values within each category. Five random values from each parameter category are sampled. The average and standard deviation (in parenthesis) of these five values are tabulated below, which provide the absolute performances of the jump detection tests under the Merton model. The other parameters are held constant at their calibrated values presented in Table 3, subject to Section 4.2.

Additionally, heat maps for each parameter category are superimposed on the tabulated results, which provide the relative performances of the jump detection tests, per parameter category, under the Merton model. The relative MCC performances are displayed in green and the relative BMI performances in blue. The darker the shade, the higher the rank of the jump detection test. As the colour fades, the rank of the jump detection test declines. The absolute and relative sensitivity of each jump detection test to changes in the variable parameter values can be examined. For both the MCC and BMI, changes in the relative performances of the jump detection tests can be observed across the parameter categories (rows), as well as per parameter category (columns). Moreover, the MCC and BMI rankings of each jump detection test, for every parameter category, can be directly compared. A light green and dark blue combination implies that the jump detection test's MCC performance ranks low, while its BMI performance ranks high, over that parameter category.

D.1 Volatility parameter: σ_V

Table 54 Jump detection test performances when σ_V is stressed under the Merton model at the 30-second sampling frequency.

	σ_V				
	[0, 0.01)	**[0.01, 0.09)**	**[0.09, 0.33)**	**[0.33, 0.5)**	**[0.5, 1]**
MCC					
LM	0.9986 (0.0002)	0.9973 (0.0005)	0.9937 (0.0016)	0.9883 (0.0012)	0.9805 (0.0031)
MED-RATIO	0.9913 (0.0172)	0.9679 (0.0184)	0.9888 (0.0021)	0.9796 (0.0020)	0.9697 (0.0052)
MIN-RATIO	0.9876 (0.0246)	0.9566 (0.0265)	0.9869 (0.0022)	0.9775 (0.0018)	0.9655 (0.0062)
ABD-RATIO	0.9846 (0.0311)	0.9460 (0.0321)	0.9863 (0.0016)	0.9786 (0.0020)	0.9686 (0.0053)
BNS-RATIO	0.9846 (0.0311)	0.9456 (0.0324)	0.9863 (0.0015)	0.9786 (0.0020)	0.9687 (0.0053)
CPR-RATIO	0.9786 (0.0435)	0.9250 (0.0452)	0.9840 (0.0014)	0.9782 (0.0018)	0.9693 (0.0044)
MED	0.9913 (0.0172)	0.9393 (0.0046)	0.9317 (0.0029)	0.9213 (0.0023)	0.9107 (0.0053)
MIN	0.9876 (0.0246)	0.9174 (0.0043)	0.9081 (0.0035)	0.8970 (0.0021)	0.8842 (0.0066)
ABD	0.9846 (0.0311)	0.8982 (0.0059)	0.8896 (0.0030)	0.8797 (0.0021)	0.8687 (0.0057)
BNS	0.9846 (0.0311)	0.8976 (0.0058)	0.8892 (0.0029)	0.8795 (0.0021)	0.8686 (0.0056)
CPR	0.9786 (0.0435)	0.8598 (0.0069)	0.8510 (0.0027)	0.8421 (0.0019)	0.8326 (0.0046)
RATIO	-	0.3208 (0.2530)	0.8146 (0.0483)	0.8648 (0.0008)	0.8618 (0.0022)
LOG	-	0.3208 (0.2530)	0.8146 (0.0482)	0.8648 (0.0008)	0.8618 (0.0022)
DIFF	-	0.3191 (0.2502)	0.8078 (0.0480)	0.8568 (0.0008)	0.8548 (0.0023)
BMI					
LM	0.9974 (0.0001)	0.9956 (0.0010)	0.9889 (0.0031)	0.9782 (0.0023)	0.9633 (0.0060)
MED-RATIO	0.9983 (0.0017)	0.9939 (0.0008)	0.9858 (0.0053)	0.9671 (0.0039)	0.9488 (0.0096)
MIN-RATIO	0.9977 (0.0025)	0.9923 (0.0012)	0.9842 (0.0059)	0.9646 (0.0034)	0.9425 (0.0114)
ABD-RATIO	0.9976 (0.0032)	0.9915 (0.0020)	0.9857 (0.0050)	0.9682 (0.0037)	0.9495 (0.0098)
BNS-RATIO	0.9976 (0.0032)	0.9915 (0.0020)	0.9858 (0.0049)	0.9682 (0.0038)	0.9497 (0.0098)
CPR-RATIO	0.9971 (0.0046)	0.9894 (0.0038)	0.9869 (0.0043)	0.9712 (0.0034)	0.9544 (0.0082)
MED	0.9983 (0.0017)	0.9911 (0.0020)	0.9803 (0.0054)	0.9623 (0.0039)	0.9438 (0.0094)
MIN	0.9977 (0.0025)	0.9883 (0.0021)	0.9764 (0.0059)	0.9573 (0.0033)	0.9352 (0.0114)
ABD	0.9976 (0.0032)	0.9863 (0.0022)	0.9759 (0.0051)	0.9594 (0.0035)	0.9404 (0.0099)
BNS	0.9976 (0.0032)	0.9863 (0.0021)	0.9759 (0.0050)	0.9593 (0.0035)	0.9406 (0.0098)
CPR	0.9971 (0.0046)	0.9817 (0.0023)	0.9725 (0.0045)	0.9579 (0.0030)	0.9415 (0.0080)
RATIO	0.0000 (0.0000)	0.5759 (0.3939)	0.9681 (0.0056)	0.9634 (0.0023)	0.9495 (0.0060)
LOG	0.0000 (0.0000)	0.5759 (0.3939)	0.9681 (0.0056)	0.9634 (0.0023)	0.9495 (0.0060)
DIFF	0.0000 (0.0000)	0.5756 (0.3924)	0.9671 (0.0058)	0.9626 (0.0023)	0.9490 (0.0060)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_V stressed five times per parameter category.

Table 55 Jump detection test performances when σ_V is stressed under the Merton model at the 1-minute sampling frequency.

	σ_V				
	[0, 0.01)	**[0.01, 0.09)**	**[0.09, 0.33)**	**[0.33, 0.5)**	**[0.5, 1]**
MCC					
LM	0.9981 (0.0002)	0.9965 (0.0009)	0.9916 (0.0022)	0.9833 (0.0020)	0.9744 (0.0044)
MED-RATIO	0.9954 (0.0090)	0.9667 (0.0148)	0.9845 (0.0025)	0.9750 (0.0018)	0.9616 (0.0067)
MIN-RATIO	0.9935 (0.0129)	0.9569 (0.0200)	0.9819 (0.0031)	0.9714 (0.0022)	0.9558 (0.0078)
ABD-RATIO	0.9915 (0.0175)	0.9420 (0.0278)	0.9807 (0.0018)	0.9718 (0.0021)	0.9590 (0.0068)
BNS-RATIO	0.9914 (0.0177)	0.9417 (0.0278)	0.9805 (0.0017)	0.9719 (0.0020)	0.9592 (0.0067)
CPR-RATIO	0.9892 (0.0227)	0.9266 (0.0361)	0.9783 (0.0014)	0.9710 (0.0018)	0.9598 (0.0059)
MED	0.9954 (0.0090)	0.9380 (0.0103)	0.9253 (0.0037)	0.9134 (0.0020)	0.8997 (0.0067)
MIN	0.9935 (0.0129)	0.9221 (0.0104)	0.9086 (0.0048)	0.8954 (0.0023)	0.8792 (0.0080)
ABD	0.9915 (0.0175)	0.8944 (0.0140)	0.8801 (0.0035)	0.8686 (0.0023)	0.8552 (0.0071)
BNS	0.9914 (0.0177)	0.8936 (0.0142)	0.8793 (0.0035)	0.8682 (0.0021)	0.8549 (0.0070)
CPR	0.9892 (0.0227)	0.8672 (0.0168)	0.8516 (0.0032)	0.8406 (0.0020)	0.8286 (0.0060)
RATIO	-0.2558 (0.0099)	0.3200 (0.2474)	0.7987 (0.0457)	0.8439 (0.0005)	0.8392 (0.0040)
LOG	-0.2558 (0.0099)	0.3200 (0.2474)	0.7987 (0.0457)	0.8439 (0.0005)	0.8392 (0.0040)
DIFF	-0.2558 (0.0099)	0.3170 (0.2415)	0.7847 (0.0450)	0.8298 (0.0004)	0.8254 (0.0036)
BMI					
LM	0.9962 (0.0003)	0.9939 (0.0017)	0.9846 (0.0042)	0.9685 (0.0038)	0.9516 (0.0084)
MED-RATIO	0.9985 (0.0009)	0.9932 (0.0012)	0.9822 (0.0068)	0.9613 (0.0035)	0.9366 (0.0121)
MIN-RATIO	0.9980 (0.0012)	0.9917 (0.0011)	0.9800 (0.0079)	0.9574 (0.0043)	0.9288 (0.0142)
ABD-RATIO	0.9980 (0.0018)	0.9906 (0.0012)	0.9820 (0.0064)	0.9609 (0.0041)	0.9369 (0.0127)
BNS-RATIO	0.9980 (0.0018)	0.9906 (0.0012)	0.9821 (0.0064)	0.9611 (0.0039)	0.9374 (0.0124)
CPR-RATIO	0.9978 (0.0022)	0.9891 (0.0024)	0.9837 (0.0054)	0.9642 (0.0037)	0.9429 (0.0111)
MED	0.9985 (0.0009)	0.9904 (0.0031)	0.9764 (0.0069)	0.9556 (0.0034)	0.9319 (0.0117)
MIN	0.9980 (0.0012)	0.9880 (0.0035)	0.9726 (0.0080)	0.9502 (0.0042)	0.9220 (0.0139)
ABD	0.9980 (0.0018)	0.9853 (0.0035)	0.9716 (0.0064)	0.9509 (0.0040)	0.9274 (0.0122)
BNS	0.9980 (0.0018)	0.9852 (0.0035)	0.9716 (0.0064)	0.9510 (0.0038)	0.9279 (0.0119)
CPR	0.9978 (0.0022)	0.9822 (0.0037)	0.9700 (0.0053)	0.9513 (0.0034)	0.9309 (0.0102)
RATIO	-0.0001 (0.0000)	0.5770 (0.3907)	0.9633 (0.0049)	0.9552 (0.0031)	0.9382 (0.0087)
LOG	-0.0001 (0.0000)	0.5770 (0.3907)	0.9633 (0.0049)	0.9552 (0.0031)	0.9382 (0.0087)
DIFF	-0.0001 (0.0000)	0.5761 (0.3879)	0.9611 (0.0052)	0.9538 (0.0031)	0.9373 (0.0083)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_V stressed five times per parameter category.

Table 56 Jump detection test performances when σ_V is stressed under the Merton model at the 5-minute sampling frequency.

	σ_V				
	[0, 0.01)	**[0.01, 0.09)**	**[0.09, 0.33)**	**[0.33, 0.5)**	**[0.5, 1]**
MCC					
LM	0.9950 (0.0000)	0.9924 (0.0021)	0.9820 (0.0049)	0.9661 (0.0033)	0.9459 (0.0108)
MED-RATIO	0.9981 (0.0001)	0.9603 (0.0201)	0.9657 (0.0043)	0.9478 (0.0042)	0.9228 (0.0125)
MIN-RATIO	0.9976 (0.0004)	0.9651 (0.0170)	0.9680 (0.0050)	0.9475 (0.0049)	0.9189 (0.0142)
ABD-RATIO	0.9981 (0.0001)	0.9382 (0.0310)	0.9563 (0.0033)	0.9401 (0.0044)	0.9128 (0.0131)
BNS-RATIO	0.9984 (0.0001)	0.9376 (0.0318)	0.9563 (0.0033)	0.9407 (0.0046)	0.9138 (0.0128)
CPR-RATIO	0.9986 (0.0001)	0.9303 (0.0357)	0.9521 (0.0027)	0.9390 (0.0038)	0.9143 (0.0120)
MED	0.9981 (0.0001)	0.9357 (0.0325)	0.9040 (0.0065)	0.8832 (0.0042)	0.8575 (0.0128)
MIN	0.9976 (0.0004)	0.9429 (0.0276)	0.9148 (0.0064)	0.8924 (0.0053)	0.8626 (0.0147)
ABD	0.9981 (0.0001)	0.9019 (0.0475)	0.8633 (0.0067)	0.8418 (0.0043)	0.8138 (0.0137)
BNS	0.9984 (0.0001)	0.9010 (0.0481)	0.8615 (0.0068)	0.8405 (0.0045)	0.8128 (0.0135)
CPR	0.9986 (0.0001)	0.8907 (0.0535)	0.8494 (0.0062)	0.8302 (0.0036)	0.8054 (0.0123)
RATIO	-0.0798 (0.1375)	0.3246 (0.2103)	0.7275 (0.0403)	0.7641 (0.0014)	0.7483 (0.0092)
LOG	-0.0798 (0.1375)	0.3246 (0.2102)	0.7274 (0.0404)	0.7639 (0.0014)	0.7481 (0.0094)
DIFF	0.7118 (0.4123)	0.3195 (0.1822)	0.6771 (0.0373)	0.7115 (0.0011)	0.6980 (0.0086)
BMI					
LM	0.9902 (0.0001)	0.9862 (0.0035)	0.9670 (0.0091)	0.9371 (0.0062)	0.8996 (0.0198)
MED-RATIO	0.9965 (0.0001)	0.9886 (0.0046)	0.9684 (0.0103)	0.9335 (0.0077)	0.8889 (0.0218)
MIN-RATIO	0.9956 (0.0008)	0.9886 (0.0049)	0.9648 (0.0124)	0.9241 (0.0090)	0.8730 (0.0246)
ABD-RATIO	0.9966 (0.0002)	0.9865 (0.0052)	0.9668 (0.0112)	0.9302 (0.0079)	0.8822 (0.0229)
BNS-RATIO	0.9972 (0.0002)	0.9871 (0.0052)	0.9675 (0.0111)	0.9318 (0.0082)	0.8843 (0.0224)
CPR-RATIO	0.9974 (0.0002)	0.9869 (0.0053)	0.9698 (0.0096)	0.9379 (0.0071)	0.8941 (0.0211)
MED	0.9965 (0.0001)	0.9863 (0.0066)	0.9626 (0.0104)	0.9281 (0.0074)	0.8844 (0.0213)
MIN	0.9956 (0.0008)	0.9864 (0.0067)	0.9597 (0.0124)	0.9193 (0.0088)	0.8688 (0.0244)
ABD	0.9966 (0.0002)	0.9824 (0.0083)	0.9570 (0.0113)	0.9208 (0.0074)	0.8743 (0.0224)
BNS	0.9972 (0.0002)	0.9830 (0.0083)	0.9575 (0.0112)	0.9221 (0.0076)	0.8762 (0.0219)
CPR	0.9974 (0.0002)	0.9824 (0.0085)	0.9590 (0.0097)	0.9275 (0.0065)	0.8861 (0.0202)
RATIO	0.0062 (0.0107)	0.6044 (0.3518)	0.9414 (0.0048)	0.9258 (0.0055)	0.8909 (0.0171)
LOG	0.0062 (0.0107)	0.6043 (0.3518)	0.9414 (0.0048)	0.9258 (0.0055)	0.8908 (0.0173)
DIFF	0.8086 (0.3501)	0.6172 (0.3073)	0.9306 (0.0055)	0.9179 (0.0048)	0.8854 (0.0162)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_V stressed five times per parameter category.

Table 57 Jump detection test performances when σ_V is stressed under the Merton model at the 15-minute sampling frequency.

	σ_V				
	[0, 0.01)	**[0.01, 0.09)**	**[0.09, 0.33)**	**[0.33, 0.5)**	**[0.5, 1]**
MCC					
LM	0.9894 (0.0001)	0.9861 (0.0030)	0.9695 (0.0081)	0.9426 (0.0064)	0.9082 (0.0169)
MED-RATIO	0.9949 (0.0001)	0.9466 (0.0283)	0.9280 (0.0079)	0.8977 (0.0068)	0.8568 (0.0204)
MIN-RATIO	0.9937 (0.0004)	0.9698 (0.0145)	0.9450 (0.0125)	0.9025 (0.0093)	0.8494 (0.0272)
ABD-RATIO	0.9946 (0.0000)	0.9267 (0.0390)	0.9114 (0.0078)	0.8798 (0.0073)	0.8351 (0.0226)
BNS-RATIO	0.9958 (0.0000)	0.9258 (0.0402)	0.9111 (0.0074)	0.8801 (0.0072)	0.8366 (0.0222)
CPR-RATIO	0.9951 (0.0000)	0.9253 (0.0401)	0.9103 (0.0069)	0.8802 (0.0072)	0.8373 (0.0216)
MED	0.9949 (0.0001)	0.9309 (0.0402)	0.8802 (0.0104)	0.8462 (0.0075)	0.8042 (0.0209)
MIN	0.9937 (0.0004)	0.9602 (0.0222)	0.9172 (0.0136)	0.8731 (0.0095)	0.8190 (0.0279)
ABD	0.9946 (0.0000)	0.9014 (0.0570)	0.8391 (0.0112)	0.8015 (0.0079)	0.7552 (0.0234)
BNS	0.9958 (0.0000)	0.9002 (0.0584)	0.8369 (0.0110)	0.7995 (0.0077)	0.7545 (0.0230)
CPR	0.9951 (0.0000)	0.8999 (0.0584)	0.8371 (0.0104)	0.8009 (0.0079)	0.7568 (0.0222)
RATIO	0.9783 (0.0437)	0.4335 (0.0939)	0.6087 (0.0247)	0.6218 (0.0032)	0.5954 (0.0143)
LOG	0.9783 (0.0438)	0.4335 (0.0939)	0.6085 (0.0248)	0.6215 (0.0033)	0.5951 (0.0144)
DIFF	0.9929 (0.0107)	0.4224 (0.1285)	0.5325 (0.0203)	0.5428 (0.0033)	0.5196 (0.0118)
BMI					
LM	0.9794 (0.0001)	0.9741 (0.0049)	0.9440 (0.0152)	0.8942 (0.0118)	0.8322 (0.0298)
MED-RATIO	0.9905 (0.0001)	0.9798 (0.0075)	0.9457 (0.0169)	0.8883 (0.0121)	0.8184 (0.0340)
MIN-RATIO	0.9882 (0.0008)	0.9779 (0.0093)	0.9313 (0.0224)	0.8561 (0.0159)	0.7679 (0.0441)
ABD-RATIO	0.9900 (0.0001)	0.9778 (0.0083)	0.9423 (0.0180)	0.8804 (0.0135)	0.8044 (0.0368)
BNS-RATIO	0.9921 (0.0001)	0.9798 (0.0082)	0.9451 (0.0175)	0.8838 (0.0131)	0.8098 (0.0361)
CPR-RATIO	0.9909 (0.0000)	0.9786 (0.0084)	0.9446 (0.0166)	0.8854 (0.0132)	0.8127 (0.0352)
MED	0.9905 (0.0001)	0.9785 (0.0089)	0.9412 (0.0168)	0.8844 (0.0122)	0.8153 (0.0337)
MIN	0.9882 (0.0008)	0.9770 (0.0101)	0.9287 (0.0224)	0.8540 (0.0159)	0.7659 (0.0440)
ABD	0.9900 (0.0001)	0.9749 (0.0109)	0.9342 (0.0180)	0.8730 (0.0135)	0.7984 (0.0365)
BNS	0.9921 (0.0001)	0.9769 (0.0109)	0.9368 (0.0176)	0.8762 (0.0130)	0.8037 (0.0357)
CPR	0.9909 (0.0000)	0.9757 (0.0112)	0.9363 (0.0166)	0.8780 (0.0131)	0.8068 (0.0350)
RATIO	0.9940 (0.0044)	0.8167 (0.0789)	0.9014 (0.0058)	0.8723 (0.0081)	0.8214 (0.0251)
LOG	0.9940 (0.0044)	0.8167 (0.0789)	0.9014 (0.0058)	0.8722 (0.0082)	0.8212 (0.0251)
DIFF	0.9953 (0.0009)	0.7985 (0.0960)	0.8744 (0.0057)	0.8513 (0.0077)	0.8058 (0.0224)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_S = 0.15$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_V stressed five times per parameter category.

D.2 Jump volatility parameter: σ_S

Table 58 Jump detection test performances when σ_S is stressed under the Merton model at the 30-second sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9970 (0.0009)	0.9972 (0.0003)	0.9975 (0.0002)	0.9975 (0.0001)	0.9977 (0.0001)
MED-RATIO	0.9923 (0.0014)	0.9957 (0.0005)	0.9926 (0.0021)	0.9814 (0.0039)	0.9649 (0.0047)
MIN-RATIO	0.9905 (0.0018)	0.9946 (0.0006)	0.9890 (0.0032)	0.9729 (0.0056)	0.9502 (0.0074)
ABD-RATIO	0.9886 (0.0018)	0.9940 (0.0006)	0.9874 (0.0040)	0.9678 (0.0069)	0.9381 (0.0096)
BNS-RATIO	0.9886 (0.0018)	0.9940 (0.0006)	0.9874 (0.0041)	0.9676 (0.0069)	0.9376 (0.0094)
CPR-RATIO	0.9845 (0.0021)	0.9916 (0.0009)	0.9815 (0.0055)	0.9540 (0.0096)	0.9133 (0.0127)
MED	0.9369 (0.0015)	0.9376 (0.0003)	0.9380 (0.0004)	0.9380 (0.0002)	0.9387 (0.0003)
MIN	0.9146 (0.0019)	0.9146 (0.0003)	0.9150 (0.0004)	0.9148 (0.0006)	0.9159 (0.0002)
ABD	0.8951 (0.0014)	0.8955 (0.0005)	0.8966 (0.0004)	0.8964 (0.0002)	0.8963 (0.0003)
BNS	0.8946 (0.0014)	0.8954 (0.0006)	0.8960 (0.0004)	0.8956 (0.0003)	0.8956 (0.0004)
CPR	0.8560 (0.0013)	0.8560 (0.0002)	0.8572 (0.0007)	0.8578 (0.0004)	0.8573 (0.0004)
RATIO	0.7416 (0.0327)	0.8708 (0.0141)	0.6958 (0.0747)	0.4304 (0.0558)	0.2508 (0.0409)
LOG	0.7416 (0.0327)	0.8708 (0.0141)	0.6958 (0.0747)	0.4304 (0.0558)	0.2508 (0.0409)
DIFF	0.7343 (0.0327)	0.8637 (0.0138)	0.6888 (0.0737)	0.4281 (0.0550)	0.2510 (0.0404)
BMI					
LM	0.9952 (0.0017)	0.9955 (0.0006)	0.9964 (0.0005)	0.9964 (0.0003)	0.9969 (0.0002)
MED-RATIO	0.9956 (0.0026)	0.9969 (0.0007)	0.9972 (0.0007)	0.9966 (0.0003)	0.9954 (0.0004)
MIN-RATIO	0.9949 (0.0030)	0.9965 (0.0007)	0.9965 (0.0006)	0.9955 (0.0005)	0.9938 (0.0008)
ABD-RATIO	0.9953 (0.0026)	0.9968 (0.0006)	0.9967 (0.0007)	0.9953 (0.0006)	0.9926 (0.0009)
BNS-RATIO	0.9954 (0.0025)	0.9968 (0.0006)	0.9967 (0.0007)	0.9953 (0.0006)	0.9926 (0.0009)
CPR-RATIO	0.9954 (0.0022)	0.9967 (0.0006)	0.9964 (0.0007)	0.9941 (0.0010)	0.9899 (0.0014)
MED	0.9900 (0.0026)	0.9911 (0.0007)	0.9917 (0.0007)	0.9922 (0.0002)	0.9928 (0.0002)
MIN	0.9871 (0.0030)	0.9882 (0.0008)	0.9889 (0.0006)	0.9894 (0.0002)	0.9901 (0.0002)
ABD	0.9853 (0.0026)	0.9863 (0.0006)	0.9870 (0.0007)	0.9874 (0.0002)	0.9878 (0.0002)
BNS	0.9853 (0.0025)	0.9863 (0.0006)	0.9869 (0.0007)	0.9873 (0.0002)	0.9878 (0.0003)
CPR	0.9807 (0.0021)	0.9814 (0.0006)	0.9821 (0.0006)	0.9825 (0.0002)	0.9828 (0.0002)
RATIO	0.9616 (0.0060)	0.9836 (0.0019)	0.9503 (0.0202)	0.8279 (0.0472)	0.5901 (0.0865)
LOG	0.9616 (0.0060)	0.9836 (0.0019)	0.9503 (0.0202)	0.8279 (0.0472)	0.5902 (0.0865)
DIFF	0.9601 (0.0061)	0.9826 (0.0019)	0.9486 (0.0205)	0.8261 (0.0471)	0.5907 (0.0853)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_S stressed five times per parameter category.

Table 59 Jump detection test performances when σ_S is stressed under the Merton model at the 1-minute sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9962 (0.0012)	0.9965 (0.0003)	0.9968 (0.0003)	0.9971 (0.0001)	0.9974 (0.0002)
MED-RATIO	0.9886 (0.0017)	0.9937 (0.0006)	0.9888 (0.0029)	0.9760 (0.0042)	0.9606 (0.0044)
MIN-RATIO	0.9869 (0.0021)	0.9921 (0.0008)	0.9879 (0.0034)	0.9713 (0.0050)	0.9517 (0.0063)
ABD-RATIO	0.9835 (0.0022)	0.9907 (0.0008)	0.9823 (0.0050)	0.9592 (0.0070)	0.9313 (0.0078)
BNS-RATIO	0.9834 (0.0020)	0.9906 (0.0008)	0.9821 (0.0050)	0.9588 (0.0072)	0.9304 (0.0080)
CPR-RATIO	0.9794 (0.0022)	0.9881 (0.0009)	0.9774 (0.0067)	0.9473 (0.0094)	0.9105 (0.0100)
MED	0.9322 (0.0019)	0.9332 (0.0004)	0.9346 (0.0006)	0.9350 (0.0004)	0.9371 (0.0006)
MIN	0.9168 (0.0023)	0.9171 (0.0004)	0.9186 (0.0006)	0.9201 (0.0006)	0.9221 (0.0001)
ABD	0.8867 (0.0019)	0.8883 (0.0006)	0.8894 (0.0003)	0.8907 (0.0003)	0.8917 (0.0006)
BNS	0.8860 (0.0019)	0.8877 (0.0008)	0.8885 (0.0003)	0.8896 (0.0006)	0.8910 (0.0006)
CPR	0.8578 (0.0016)	0.8581 (0.0005)	0.8604 (0.0006)	0.8612 (0.0005)	0.8624 (0.0007)
RATIO	0.7291 (0.0318)	0.8546 (0.0131)	0.6844 (0.0738)	0.4257 (0.0540)	0.2524 (0.0400)
LOG	0.7290 (0.0318)	0.8546 (0.0131)	0.6844 (0.0738)	0.4257 (0.0540)	0.2524 (0.0400)
DIFF	0.7167 (0.0306)	0.8404 (0.0131)	0.6721 (0.0718)	0.4210 (0.0523)	0.2527 (0.0390)
BMI					
LM	0.9934 (0.0024)	0.9941 (0.0005)	0.9949 (0.0006)	0.9952 (0.0002)	0.9956 (0.0003)
MED-RATIO	0.9943 (0.0033)	0.9961 (0.0008)	0.9963 (0.0007)	0.9958 (0.0003)	0.9948 (0.0005)
MIN-RATIO	0.9935 (0.0039)	0.9955 (0.0007)	0.9958 (0.0006)	0.9950 (0.0005)	0.9936 (0.0008)
ABD-RATIO	0.9936 (0.0034)	0.9958 (0.0007)	0.9957 (0.0009)	0.9941 (0.0007)	0.9916 (0.0008)
BNS-RATIO	0.9937 (0.0034)	0.9958 (0.0007)	0.9957 (0.0008)	0.9941 (0.0007)	0.9915 (0.0009)
CPR-RATIO	0.9939 (0.0030)	0.9959 (0.0006)	0.9955 (0.0010)	0.9930 (0.0009)	0.9893 (0.0012)
MED	0.9888 (0.0033)	0.9901 (0.0008)	0.9909 (0.0006)	0.9916 (0.0002)	0.9924 (0.0002)
MIN	0.9864 (0.0039)	0.9879 (0.0006)	0.9887 (0.0006)	0.9897 (0.0001)	0.9905 (0.0002)
ABD	0.9833 (0.0033)	0.9849 (0.0008)	0.9857 (0.0006)	0.9865 (0.0002)	0.9871 (0.0002)
BNS	0.9833 (0.0033)	0.9849 (0.0008)	0.9857 (0.0007)	0.9864 (0.0002)	0.9871 (0.0002)
CPR	0.9802 (0.0029)	0.9813 (0.0006)	0.9823 (0.0006)	0.9829 (0.0004)	0.9834 (0.0002)
RATIO	0.9584 (0.0060)	0.9811 (0.0019)	0.9470 (0.0208)	0.8242 (0.0467)	0.5933 (0.0837)
LOG	0.9584 (0.0060)	0.9811 (0.0019)	0.9470 (0.0208)	0.8242 (0.0467)	0.5934 (0.0837)
DIFF	0.9558 (0.0060)	0.9790 (0.0021)	0.9438 (0.0212)	0.8206 (0.0461)	0.5944 (0.0815)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_S stressed five times per parameter category.

Table 60 Jump detection test performances when σ_S is stressed under the Merton model at the 5-minute sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9912 (0.0029)	0.9920 (0.0006)	0.9926 (0.0003)	0.9933 (0.0002)	0.9936 (0.0002)
MED-RATIO	0.9737 (0.0032)	0.9793 (0.0007)	0.9715 (0.0044)	0.9525 (0.0044)	0.9397 (0.0021)
MIN-RATIO	0.9773 (0.0039)	0.9844 (0.0010)	0.9775 (0.0035)	0.9621 (0.0036)	0.9508 (0.0024)
ABD-RATIO	0.9608 (0.0041)	0.9731 (0.0013)	0.9581 (0.0077)	0.9286 (0.0066)	0.9087 (0.0036)
BNS-RATIO	0.9608 (0.0041)	0.9729 (0.0013)	0.9575 (0.0076)	0.9281 (0.0069)	0.9079 (0.0034)
CPR-RATIO	0.9547 (0.0040)	0.9680 (0.0012)	0.9501 (0.0086)	0.9175 (0.0074)	0.8969 (0.0039)
MED	0.9161 (0.0033)	0.9157 (0.0009)	0.9181 (0.0006)	0.9187 (0.0005)	0.9234 (0.0024)
MIN	0.9275 (0.0042)	0.9303 (0.0009)	0.9309 (0.0004)	0.9309 (0.0008)	0.9351 (0.0018)
ABD	0.8750 (0.0034)	0.8762 (0.0006)	0.8770 (0.0003)	0.8788 (0.0011)	0.8843 (0.0024)
BNS	0.8734 (0.0033)	0.8741 (0.0005)	0.8749 (0.0006)	0.8773 (0.0008)	0.8834 (0.0026)
CPR	0.8603 (0.0031)	0.8601 (0.0008)	0.8601 (0.0002)	0.8630 (0.0014)	0.8707 (0.0025)
RATIO	0.6677 (0.0283)	0.7833 (0.0136)	0.6277 (0.0608)	0.4174 (0.0435)	0.2747 (0.0334)
LOG	0.6676 (0.0283)	0.7833 (0.0136)	0.6277 (0.0607)	0.4175 (0.0435)	0.2748 (0.0334)
DIFF	0.6225 (0.0253)	0.7310 (0.0126)	0.5865 (0.0553)	0.3984 (0.0387)	0.2725 (0.0296)
BMI					
LM	0.9846 (0.0055)	0.9865 (0.0013)	0.9879 (0.0005)	0.9889 (0.0003)	0.9892 (0.0003)
MED-RATIO	0.9882 (0.0059)	0.9909 (0.0013)	0.9918 (0.0004)	0.9907 (0.0005)	0.9901 (0.0003)
MIN-RATIO	0.9875 (0.0070)	0.9909 (0.0015)	0.9922 (0.0004)	0.9916 (0.0003)	0.9914 (0.0003)
ABD-RATIO	0.9867 (0.0062)	0.9905 (0.0014)	0.9908 (0.0006)	0.9884 (0.0007)	0.9870 (0.0003)
BNS-RATIO	0.9873 (0.0061)	0.9910 (0.0015)	0.9912 (0.0006)	0.9890 (0.0008)	0.9875 (0.0003)
CPR-RATIO	0.9878 (0.0054)	0.9910 (0.0013)	0.9908 (0.0009)	0.9880 (0.0010)	0.9862 (0.0004)
MED	0.9825 (0.0058)	0.9844 (0.0013)	0.9864 (0.0005)	0.9871 (0.0003)	0.9885 (0.0005)
MIN	0.9825 (0.0070)	0.9855 (0.0015)	0.9875 (0.0003)	0.9884 (0.0003)	0.9898 (0.0004)
ABD	0.9772 (0.0060)	0.9798 (0.0014)	0.9817 (0.0002)	0.9825 (0.0002)	0.9841 (0.0003)
BNS	0.9776 (0.0059)	0.9800 (0.0014)	0.9819 (0.0002)	0.9830 (0.0002)	0.9846 (0.0004)
CPR	0.9770 (0.0052)	0.9786 (0.0013)	0.9803 (0.0001)	0.9813 (0.0001)	0.9831 (0.0003)
RATIO	0.9407 (0.0074)	0.9675 (0.0025)	0.9298 (0.0209)	0.8181 (0.0386)	0.6382 (0.0620)
LOG	0.9407 (0.0074)	0.9675 (0.0025)	0.9298 (0.0209)	0.8181 (0.0386)	0.6383 (0.0620)
DIFF	0.9277 (0.0076)	0.9577 (0.0028)	0.9155 (0.0224)	0.8018 (0.0374)	0.6351 (0.0554)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_S stressed five times per parameter category.

Table 61 Jump detection test performances when σ_S is stressed under the Merton model at the 15-minute sampling frequency.

	σ_S				
	[0, 0.4)	**[0.4, 0.66)**	**[0.66, 0.8)**	**[0.8, 0.9)**	**[0.9, 1]**
MCC					
LM	0.9844 (0.0052)	0.9859 (0.0010)	0.9872 (0.0001)	0.9882 (0.0004)	0.9892 (0.0001)
MED-RATIO	0.9417 (0.0053)	0.9508 (0.0014)	0.9422 (0.0043)	0.9304 (0.0016)	0.9336 (0.0044)
MIN-RATIO	0.9664 (0.0074)	0.9709 (0.0014)	0.9680 (0.0017)	0.9629 (0.0011)	0.9640 (0.0023)
ABD-RATIO	0.9243 (0.0061)	0.9373 (0.0020)	0.9229 (0.0056)	0.9021 (0.0025)	0.9043 (0.0041)
BNS-RATIO	0.9233 (0.0059)	0.9368 (0.0021)	0.9217 (0.0060)	0.8992 (0.0029)	0.9011 (0.0041)
CPR-RATIO	0.9221 (0.0060)	0.9352 (0.0018)	0.9205 (0.0060)	0.8997 (0.0024)	0.9028 (0.0043)
MED	0.8994 (0.0058)	0.9009 (0.0016)	0.9027 (0.0005)	0.9097 (0.0022)	0.9244 (0.0065)
MIN	0.9416 (0.0079)	0.9431 (0.0018)	0.9454 (0.0012)	0.9491 (0.0016)	0.9589 (0.0035)
ABD	0.8590 (0.0063)	0.8605 (0.0008)	0.8606 (0.0013)	0.8672 (0.0036)	0.8888 (0.0081)
BNS	0.8560 (0.0062)	0.8578 (0.0008)	0.8587 (0.0010)	0.8640 (0.0034)	0.8864 (0.0081)
CPR	0.8563 (0.0060)	0.8575 (0.0010)	0.8578 (0.0009)	0.8647 (0.0036)	0.8872 (0.0084)
RATIO	0.5740 (0.0189)	0.6555 (0.0084)	0.5518 (0.0403)	0.4183 (0.0258)	0.3412 (0.0150)
LOG	0.5739 (0.0189)	0.6554 (0.0084)	0.5519 (0.0403)	0.4185 (0.0258)	0.3414 (0.0150)
DIFF	0.5047 (0.0159)	0.5724 (0.0073)	0.4851 (0.0336)	0.3755 (0.0204)	0.3164 (0.0105)
BMI					
LM	0.9722 (0.0100)	0.9755 (0.0022)	0.9785 (0.0002)	0.9791 (0.0003)	0.9797 (0.0002)
MED-RATIO	0.9765 (0.0101)	0.9818 (0.0020)	0.9833 (0.0003)	0.9836 (0.0002)	0.9845 (0.0004)
MIN-RATIO	0.9712 (0.0139)	0.9775 (0.0029)	0.9801 (0.0007)	0.9814 (0.0007)	0.9839 (0.0006)
ABD-RATIO	0.9744 (0.0108)	0.9809 (0.0020)	0.9815 (0.0004)	0.9809 (0.0003)	0.9818 (0.0006)
BNS-RATIO	0.9764 (0.0106)	0.9830 (0.0020)	0.9835 (0.0005)	0.9822 (0.0003)	0.9833 (0.0006)
CPR-RATIO	0.9753 (0.0105)	0.9815 (0.0020)	0.9820 (0.0004)	0.9814 (0.0002)	0.9825 (0.0006)
MED	0.9721 (0.0099)	0.9766 (0.0020)	0.9791 (0.0005)	0.9813 (0.0005)	0.9836 (0.0006)
MIN	0.9690 (0.0138)	0.9749 (0.0030)	0.9780 (0.0007)	0.9802 (0.0009)	0.9836 (0.0006)
ABD	0.9668 (0.0106)	0.9720 (0.0018)	0.9740 (0.0008)	0.9765 (0.0010)	0.9800 (0.0010)
BNS	0.9686 (0.0103)	0.9737 (0.0018)	0.9759 (0.0008)	0.9780 (0.0010)	0.9817 (0.0010)
CPR	0.9676 (0.0102)	0.9723 (0.0019)	0.9744 (0.0006)	0.9770 (0.0009)	0.9807 (0.0010)
RATIO	0.9071 (0.0088)	0.9368 (0.0026)	0.9003 (0.0185)	0.8202 (0.0218)	0.7419 (0.0189)
LOG	0.9071 (0.0088)	0.9368 (0.0026)	0.9003 (0.0184)	0.8204 (0.0218)	0.7421 (0.0188)
DIFF	0.8760 (0.0092)	0.9097 (0.0031)	0.8667 (0.0210)	0.7808 (0.0216)	0.7091 (0.0150)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\mu_S = -0.12$ and $\lambda = 12$ with σ_S stressed five times per parameter category.

D.3 Jump mean parameter: μ_S

Table 62 Jump detection test performances when μ_S is stressed under the Merton model at the 30-second sampling frequency.

	μ_S							
	[-2, -1.6)	**[-1.6, -0.6)**	**[-0.6, -0.4)**	**[-0.4, 0.4)**	**[0.4, 0.75)**	**[0.75, 1.2)**	**[1.2, 1.51)**	**[1.51, 2]**
MCC								
LM	0.9984 (0.0000)	0.9983 (0.0000)	0.9982 (0.0000)	0.9968 (0.0011)	0.9981 (0.0000)	0.9985 (0.0001)	0.9988 (0.0000)	0.9988 (0.0000)
MED-RATIO	0.9446 (0.0005)	0.9432 (0.0011)	0.9564 (0.0044)	0.9829 (0.0094)	0.9452 (0.0028)	0.9675 (0.0146)	0.9993 (0.0009)	1.0000 (0.0000)
MIN-RATIO	0.9220 (0.0002)	0.9211 (0.0014)	0.9413 (0.0059)	0.9777 (0.0130)	0.9230 (0.0035)	0.9518 (0.0192)	0.9986 (0.0018)	1.0000 (0.0000)
ABD-RATIO	0.9039 (0.0005)	0.9029 (0.0023)	0.9267 (0.0071)	0.9723 (0.0170)	0.9027 (0.0046)	0.9378 (0.0243)	0.9979 (0.0026)	1.0000 (0.0000)
BNS-RATIO	0.9036 (0.0006)	0.9023 (0.0023)	0.9265 (0.0071)	0.9721 (0.0172)	0.9022 (0.0044)	0.9373 (0.0244)	0.9979 (0.0026)	1.0000 (0.0000)
CPR-RATIO	0.8658 (0.0003)	0.8649 (0.0029)	0.8981 (0.0091)	0.9618 (0.0246)	0.8669 (0.0054)	0.9147 (0.0326)	0.9970 (0.0037)	1.0000 (0.0000)
MED	0.9446 (0.0005)	0.9423 (0.0011)	0.9397 (0.0002)	0.9366 (0.0018)	0.9423 (0.0025)	0.9675 (0.0146)	0.9993 (0.0009)	1.0000 (0.0000)
MIN	0.9219 (0.0003)	0.9195 (0.0012)	0.9173 (0.0002)	0.9145 (0.0026)	0.9193 (0.0024)	0.9518 (0.0192)	0.9986 (0.0018)	1.0000 (0.0000)
ABD	0.9039 (0.0005)	0.9011 (0.0007)	0.8980 (0.0002)	0.8948 (0.0019)	0.8985 (0.0034)	0.9378 (0.0243)	0.9979 (0.0026)	1.0000 (0.0000)
BNS	0.9036 (0.0006)	0.9004 (0.0008)	0.8976 (0.0003)	0.8943 (0.0018)	0.8980 (0.0033)	0.9373 (0.0244)	0.9979 (0.0026)	1.0000 (0.0000)
CPR	0.8657 (0.0003)	0.8624 (0.0011)	0.8600 (0.0007)	0.8563 (0.0023)	0.8613 (0.0056)	0.9147 (0.0326)	0.9970 (0.0037)	1.0000 (0.0000)
RATIO	0.0156 (0.0006)	0.0374 (0.0245)	0.1930 (0.0315)	0.5473 (0.2095)	0.0587 (0.0448)	-	-	-
LOG	0.0156 (0.0006)	0.0374 (0.0245)	0.1930 (0.0315)	0.5473 (0.2095)	0.0587 (0.0448)	-	-	-
DIFF	0.0158 (0.0007)	0.0384 (0.0247)	0.1937 (0.0312)	0.5430 (0.2067)	0.0597 (0.0452)	-	-	-
BMI								
LM	0.9976 (0.0000)	0.9976 (0.0000)	0.9976 (0.0000)	0.9948 (0.0021)	0.9976 (0.0001)	0.9976 (0.0000)	0.9976 (0.0000)	0.9976 (0.0000)
MED-RATIO	0.9945 (0.0000)	0.9944 (0.0001)	0.9958 (0.0004)	0.9943 (0.0023)	0.9945 (0.0003)	0.9969 (0.0015)	0.9999 (0.0001)	1.0000 (0.0000)
MIN-RATIO	0.9920 (0.0000)	0.9919 (0.0002)	0.9942 (0.0006)	0.9935 (0.0022)	0.9921 (0.0004)	0.9953 (0.0020)	0.9999 (0.0002)	1.0000 (0.0000)
ABD-RATIO	0.9899 (0.0001)	0.9898 (0.0003)	0.9926 (0.0008)	0.9934 (0.0016)	0.9897 (0.0005)	0.9938 (0.0026)	0.9998 (0.0002)	1.0000 (0.0000)
BNS-RATIO	0.9898 (0.0001)	0.9897 (0.0003)	0.9926 (0.0008)	0.9934 (0.0015)	0.9896 (0.0005)	0.9937 (0.0026)	0.9998 (0.0002)	1.0000 (0.0000)
CPR-RATIO	0.9851 (0.0000)	0.9849 (0.0004)	0.9892 (0.0011)	0.9927 (0.0010)	0.9851 (0.0007)	0.9911 (0.0037)	0.9997 (0.0003)	1.0000 (0.0000)
MED	0.9945 (0.0000)	0.9943 (0.0001)	0.9940 (0.0000)	0.9896 (0.0032)	0.9942 (0.0003)	0.9969 (0.0015)	0.9999 (0.0001)	1.0000 (0.0000)
MIN	0.9920 (0.0000)	0.9917 (0.0001)	0.9915 (0.0000)	0.9869 (0.0035)	0.9916 (0.0003)	0.9953 (0.0020)	0.9999 (0.0002)	1.0000 (0.0000)
ABD	0.9899 (0.0001)	0.9895 (0.0001)	0.9892 (0.0000)	0.9849 (0.0032)	0.9892 (0.0005)	0.9938 (0.0026)	0.9998 (0.0002)	1.0000 (0.0000)
BNS	0.9898 (0.0001)	0.9895 (0.0001)	0.9891 (0.0000)	0.9849 (0.0031)	0.9891 (0.0005)	0.9937 (0.0026)	0.9998 (0.0002)	1.0000 (0.0000)
CPR	0.9850 (0.0001)	0.9845 (0.0002)	0.9842 (0.0001)	0.9804 (0.0028)	0.9843 (0.0008)	0.9911 (0.0037)	0.9997 (0.0003)	1.0000 (0.0000)
RATIO	0.0025 (0.0009)	0.0389 (0.0519)	0.4561 (0.0812)	0.8611 (0.1218)	0.0901 (0.1068)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
LOG	0.0025 (0.0009)	0.0389 (0.0519)	0.4561 (0.0812)	0.8611 (0.1218)	0.0901 (0.1068)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
DIFF	0.0029 (0.0010)	0.0407 (0.0530)	0.4581 (0.0802)	0.8595 (0.1214)	0.0927 (0.1083)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\lambda = 12$ with μ_S stressed five times per parameter category.

Table 63 Jump detection test performances when μ_S is stressed under the Merton model at the 1-minute sampling frequency.

	μ_S							
	[-2, -1.6)	**[-1.6, -0.6)**	**[-0.6, -0.4)**	**[-0.4, 0.4)**	**[0.4, 0.75)**	**[0.75, 1.2)**	**[1.2, 1.51)**	**[1.51, 2]**
MCC								
LM	0.9980 (0.0000)	0.9979 (0.0000)	0.9979 (0.0000)	0.9960 (0.0014)	0.9980 (0.0001)	0.9983 (0.0000)	0.9984 (0.0000)	0.9984 (0.0000)
MED-RATIO	0.9498 (0.0011)	0.9448 (0.0015)	0.9534 (0.0035)	0.9785 (0.0101)	0.9479 (0.0042)	0.9834 (0.0127)	1.0000 (0.0000)	1.0000 (0.0000)
MIN-RATIO	0.9335 (0.0009)	0.9287 (0.0013)	0.9404 (0.0051)	0.9737 (0.0126)	0.9314 (0.0043)	0.9744 (0.0183)	1.0000 (0.0000)	1.0000 (0.0000)
ABD-RATIO	0.9101 (0.0014)	0.9039 (0.0016)	0.9187 (0.0065)	0.9649 (0.0188)	0.9066 (0.0059)	0.9654 (0.0241)	1.0000 (0.0000)	1.0000 (0.0000)
BNS-RATIO	0.9093 (0.0013)	0.9032 (0.0017)	0.9184 (0.0064)	0.9645 (0.0189)	0.9059 (0.0059)	0.9652 (0.0242)	1.0000 (0.0000)	1.0000 (0.0000)
CPR-RATIO	0.8830 (0.0013)	0.8765 (0.0020)	0.8955 (0.0081)	0.9558 (0.0245)	0.8808 (0.0074)	0.9556 (0.0311)	1.0000 (0.0000)	1.0000 (0.0000)
MED	0.9498 (0.0011)	0.9438 (0.0027)	0.9368 (0.0007)	0.9326 (0.0026)	0.9451 (0.0062)	0.9834 (0.0127)	1.0000 (0.0000)	1.0000 (0.0000)
MIN	0.9335 (0.0010)	0.9276 (0.0022)	0.9209 (0.0005)	0.9165 (0.0026)	0.9282 (0.0056)	0.9744 (0.0183)	1.0000 (0.0000)	1.0000 (0.0000)
ABD	0.9100 (0.0014)	0.9024 (0.0032)	0.8922 (0.0007)	0.8873 (0.0027)	0.9027 (0.0081)	0.9654 (0.0241)	1.0000 (0.0000)	1.0000 (0.0000)
BNS	0.9092 (0.0013)	0.9017 (0.0032)	0.8917 (0.0010)	0.8861 (0.0026)	0.9019 (0.0084)	0.9652 (0.0242)	1.0000 (0.0000)	1.0000 (0.0000)
CPR	0.8829 (0.0013)	0.8748 (0.0039)	0.8629 (0.0008)	0.8585 (0.0030)	0.8758 (0.0102)	0.9556 (0.0311)	1.0000 (0.0000)	1.0000 (0.0000)
RATIO	0.0167 (0.0010)	0.0411 (0.0252)	0.1964 (0.0312)	0.5401 (0.2029)	0.0620 (0.0459)	-	-	-
LOG	0.0167 (0.0010)	0.0411 (0.0252)	0.1964 (0.0312)	0.5400 (0.2029)	0.0620 (0.0459)	-	-	-
DIFF	0.0177 (0.0012)	0.0436 (0.0255)	0.1977 (0.0305)	0.5321 (0.1974)	0.0644 (0.0464)	-	-	-
BMI								
LM	0.9968 (0.0000)	0.9968 (0.0000)	0.9968 (0.0001)	0.9932 (0.0028)	0.9967 (0.0001)	0.9968 (0.0000)	0.9968 (0.0000)	0.9968 (0.0000)
MED-RATIO	0.9951 (0.0001)	0.9946 (0.0001)	0.9955 (0.0003)	0.9929 (0.0029)	0.9948 (0.0005)	0.9985 (0.0012)	1.0000 (0.0000)	1.0000 (0.0000)
MIN-RATIO	0.9933 (0.0001)	0.9927 (0.0001)	0.9940 (0.0005)	0.9917 (0.0032)	0.9931 (0.0005)	0.9976 (0.0018)	1.0000 (0.0000)	1.0000 (0.0000)
ABD-RATIO	0.9906 (0.0002)	0.9898 (0.0002)	0.9916 (0.0007)	0.9915 (0.0020)	0.9901 (0.0008)	0.9966 (0.0024)	1.0000 (0.0000)	1.0000 (0.0000)
BNS-RATIO	0.9905 (0.0002)	0.9898 (0.0002)	0.9916 (0.0007)	0.9915 (0.0020)	0.9900 (0.0008)	0.9966 (0.0024)	1.0000 (0.0000)	1.0000 (0.0000)
CPR-RATIO	0.9873 (0.0002)	0.9864 (0.0003)	0.9889 (0.0010)	0.9910 (0.0012)	0.9869 (0.0010)	0.9956 (0.0032)	1.0000 (0.0000)	1.0000 (0.0000)
MED	0.9951 (0.0001)	0.9944 (0.0003)	0.9937 (0.0001)	0.9884 (0.0038)	0.9945 (0.0007)	0.9985 (0.0012)	1.0000 (0.0000)	1.0000 (0.0000)
MIN	0.9933 (0.0001)	0.9926 (0.0003)	0.9918 (0.0001)	0.9859 (0.0045)	0.9927 (0.0007)	0.9976 (0.0018)	1.0000 (0.0000)	1.0000 (0.0000)
ABD	0.9906 (0.0002)	0.9897 (0.0004)	0.9884 (0.0002)	0.9831 (0.0039)	0.9897 (0.0010)	0.9966 (0.0024)	1.0000 (0.0000)	1.0000 (0.0000)
BNS	0.9905 (0.0002)	0.9896 (0.0004)	0.9884 (0.0002)	0.9830 (0.0038)	0.9896 (0.0011)	0.9966 (0.0024)	1.0000 (0.0000)	1.0000 (0.0000)
CPR	0.9873 (0.0002)	0.9862 (0.0005)	0.9846 (0.0001)	0.9799 (0.0034)	0.9863 (0.0014)	0.9956 (0.0032)	1.0000 (0.0000)	1.0000 (0.0000)
RATIO	0.0039 (0.0012)	0.0451 (0.0555)	0.4654 (0.0793)	0.8585 (0.1192)	0.0979 (0.1111)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
LOG	0.0039 (0.0012)	0.0451 (0.0555)	0.4653 (0.0793)	0.8585 (0.1193)	0.0979 (0.1111)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
DIFF	0.0051 (0.0015)	0.0496 (0.0576)	0.4691 (0.0771)	0.8557 (0.1186)	0.1033 (0.1138)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\lambda = 12$ with μ_S stressed five times per parameter category.

Table 64 Jump detection test performances when μ_S is stressed under the Merton model at the 5-minute sampling frequency.

	μ_S							
	[-2, -1.6)	**[-1.6, -0.6)**	**[-0.6, -0.4)**	**[-0.4, 0.4)**	**[0.4, 0.75)**	**[0.75, 1.2)**	**[1.2, 1.51)**	**[1.51, 2]**
MCC								
LM	0.9962 (0.0000)	0.9960 (0.0001)	0.9956 (0.0002)	0.9910 (0.0034)	0.9959 (0.0002)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
MED-RATIO	0.9824 (0.0015)	0.9687 (0.0090)	0.9427 (0.0012)	0.9596 (0.0099)	0.9612 (0.0185)	0.9989 (0.0010)	0.9994 (0.0000)	0.9994 (0.0000)
MIN-RATIO	0.9832 (0.0016)	0.9703 (0.0079)	0.9499 (0.0009)	0.9660 (0.0083)	0.9662 (0.0154)	0.9993 (0.0009)	0.9997 (0.0000)	0.9997 (0.0000)
ABD-RATIO	0.9670 (0.0026)	0.9431 (0.0148)	0.9085 (0.0018)	0.9395 (0.0183)	0.9347 (0.0278)	0.9988 (0.0014)	0.9996 (0.0000)	0.9995 (0.0000)
BNS-RATIO	0.9668 (0.0028)	0.9422 (0.0149)	0.9070 (0.0019)	0.9391 (0.0187)	0.9339 (0.0285)	0.9991 (0.0015)	0.9999 (0.0000)	0.9998 (0.0000)
CPR-RATIO	0.9643 (0.0031)	0.9368 (0.0169)	0.8957 (0.0020)	0.9308 (0.0213)	0.9280 (0.0315)	0.9990 (0.0015)	0.9999 (0.0000)	0.9999 (0.0000)
MED	0.9822 (0.0015)	0.9680 (0.0098)	0.9324 (0.0024)	0.9173 (0.0062)	0.9600 (0.0199)	0.9989 (0.0010)	0.9994 (0.0000)	0.9994 (0.0000)
MIN	0.9831 (0.0016)	0.9698 (0.0086)	0.9399 (0.0023)	0.9280 (0.0052)	0.9649 (0.0169)	0.9993 (0.0009)	0.9997 (0.0000)	0.9997 (0.0000)
ABD	0.9669 (0.0026)	0.9423 (0.0158)	0.8934 (0.0035)	0.8760 (0.0058)	0.9328 (0.0299)	0.9988 (0.0014)	0.9996 (0.0000)	0.9995 (0.0000)
BNS	0.9668 (0.0029)	0.9414 (0.0159)	0.8923 (0.0032)	0.8747 (0.0065)	0.9321 (0.0306)	0.9991 (0.0015)	0.9999 (0.0000)	0.9998 (0.0000)
CPR	0.9642 (0.0032)	0.9358 (0.0180)	0.8792 (0.0041)	0.8611 (0.0058)	0.9259 (0.0339)	0.9990 (0.0015)	0.9999 (0.0000)	0.9999 (0.0000)
RATIO	0.0662 (0.0025)	0.0938 (0.0228)	0.2281 (0.0262)	0.5118 (0.1685)	0.1096 (0.0442)	0.0325 (0.0075)	0.0168 (0.0014)	0.0144 (0.0002)
LOG	0.0661 (0.0025)	0.0938 (0.0228)	0.2280 (0.0262)	0.5118 (0.1686)	0.1096 (0.0442)	0.0325 (0.0075)	0.0169 (0.0014)	0.0145 (0.0002)
DIFF	0.0948 (0.0016)	0.1158 (0.0188)	0.2312 (0.0231)	0.4831 (0.1507)	0.1297 (0.0356)	0.1259 (0.0513)	0.7091 (0.2284)	1.0000 (0.0001)
BMI								
LM	0.9926 (0.0000)	0.9926 (0.0000)	0.9925 (0.0002)	0.9841 (0.0063)	0.9924 (0.0002)	0.9926 (0.0000)	0.9926 (0.0000)	0.9926 (0.0000)
MED-RATIO	0.9973 (0.0001)	0.9959 (0.0009)	0.9932 (0.0001)	0.9863 (0.0057)	0.9950 (0.0020)	0.9988 (0.0001)	0.9989 (0.0000)	0.9989 (0.0000)
MIN-RATIO	0.9979 (0.0002)	0.9967 (0.0008)	0.9945 (0.0001)	0.9864 (0.0069)	0.9961 (0.0017)	0.9994 (0.0001)	0.9995 (0.0000)	0.9995 (0.0000)
ABD-RATIO	0.9962 (0.0002)	0.9937 (0.0016)	0.9898 (0.0002)	0.9841 (0.0052)	0.9927 (0.0030)	0.9992 (0.0001)	0.9992 (0.0001)	0.9990 (0.0001)
BNS-RATIO	0.9966 (0.0003)	0.9941 (0.0016)	0.9901 (0.0002)	0.9847 (0.0051)	0.9931 (0.0031)	0.9998 (0.0001)	0.9998 (0.0001)	0.9996 (0.0001)
CPR-RATIO	0.9965 (0.0003)	0.9935 (0.0019)	0.9887 (0.0002)	0.9846 (0.0040)	0.9924 (0.0035)	0.9997 (0.0001)	0.9998 (0.0000)	0.9998 (0.0000)
MED	0.9972 (0.0001)	0.9958 (0.0010)	0.9921 (0.0003)	0.9822 (0.0070)	0.9949 (0.0022)	0.9988 (0.0001)	0.9989 (0.0000)	0.9989 (0.0000)
MIN	0.9979 (0.0002)	0.9966 (0.0008)	0.9935 (0.0004)	0.9828 (0.0080)	0.9959 (0.0018)	0.9994 (0.0001)	0.9995 (0.0000)	0.9995 (0.0000)
ABD	0.9961 (0.0003)	0.9936 (0.0017)	0.9879 (0.0005)	0.9770 (0.0075)	0.9924 (0.0033)	0.9992 (0.0001)	0.9992 (0.0001)	0.9990 (0.0001)
BNS	0.9966 (0.0003)	0.9940 (0.0017)	0.9884 (0.0004)	0.9775 (0.0075)	0.9929 (0.0034)	0.9998 (0.0001)	0.9998 (0.0001)	0.9996 (0.0001)
CPR	0.9964 (0.0003)	0.9934 (0.0020)	0.9866 (0.0006)	0.9768 (0.0065)	0.9921 (0.0038)	0.9997 (0.0001)	0.9998 (0.0000)	0.9998 (0.0000)
RATIO	0.0894 (0.0061)	0.1665 (0.0681)	0.5446 (0.0580)	0.8512 (0.1002)	0.2161 (0.1295)	0.0244 (0.0106)	0.0041 (0.0018)	0.0004 (0.0004)
LOG	0.0893 (0.0061)	0.1663 (0.0681)	0.5445 (0.0580)	0.8512 (0.1003)	0.2162 (0.1295)	0.0245 (0.0106)	0.0041 (0.0018)	0.0005 (0.0004)
DIFF	0.1673 (0.0046)	0.2311 (0.0576)	0.5524 (0.0505)	0.8377 (0.0993)	0.2738 (0.1079)	0.2592 (0.1493)	0.9351 (0.0709)	1.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\lambda = 12$ with μ_S stressed five times per parameter category.

Table 65 Jump detection test performances when μ_S is stressed under the Merton model at the 15-minute sampling frequency.

	μ_S							
	[-2, -1.6)	**[-1.6, -0.6)**	**[-0.6, -0.4)**	**[-0.4, 0.4)**	**[0.4, 0.75)**	**[0.75, 1.2)**	**[1.2, 1.51)**	**[1.51, 2]**
MCC								
LM	0.9934 (0.0000)	0.9934 (0.0000)	0.9932 (0.0002)	0.9846 (0.0061)	0.9932 (0.0003)	0.9934 (0.0000)	0.9934 (0.0000)	0.9934 (0.0000)
MED-RATIO	0.9962 (0.0003)	0.9892 (0.0076)	0.9457 (0.0054)	0.9329 (0.0046)	0.9819 (0.0151)	0.9980 (0.0000)	0.9980 (0.0000)	0.9980 (0.0000)
MIN-RATIO	0.9989 (0.0001)	0.9953 (0.0037)	0.9750 (0.0027)	0.9621 (0.0045)	0.9907 (0.0083)	0.9992 (0.0000)	0.9992 (0.0000)	0.9992 (0.0000)
ABD-RATIO	0.9953 (0.0007)	0.9823 (0.0126)	0.9191 (0.0065)	0.9102 (0.0085)	0.9714 (0.0239)	0.9980 (0.0000)	0.9980 (0.0000)	0.9980 (0.0000)
BNS-RATIO	0.9964 (0.0008)	0.9827 (0.0132)	0.9171 (0.0070)	0.9084 (0.0092)	0.9709 (0.0252)	0.9991 (0.0000)	0.9992 (0.0000)	0.9992 (0.0000)
CPR-RATIO	0.9958 (0.0007)	0.9826 (0.0128)	0.9177 (0.0066)	0.9082 (0.0087)	0.9713 (0.0244)	0.9984 (0.0000)	0.9985 (0.0000)	0.9985 (0.0000)
MED	0.9961 (0.0004)	0.9888 (0.0081)	0.9401 (0.0071)	0.9034 (0.0128)	0.9810 (0.0160)	0.9980 (0.0000)	0.9980 (0.0000)	0.9980 (0.0000)
MIN	0.9989 (0.0001)	0.9952 (0.0039)	0.9717 (0.0038)	0.9445 (0.0120)	0.9902 (0.0090)	0.9992 (0.0000)	0.9992 (0.0000)	0.9992 (0.0000)
ABD	0.9951 (0.0008)	0.9815 (0.0135)	0.9091 (0.0091)	0.8641 (0.0147)	0.9696 (0.0258)	0.9980 (0.0000)	0.9980 (0.0000)	0.9980 (0.0000)
BNS	0.9963 (0.0008)	0.9821 (0.0138)	0.9075 (0.0095)	0.8614 (0.0148)	0.9695 (0.0269)	0.9991 (0.0000)	0.9992 (0.0000)	0.9992 (0.0000)
CPR	0.9956 (0.0008)	0.9819 (0.0136)	0.9077 (0.0092)	0.8618 (0.0150)	0.9695 (0.0262)	0.9984 (0.0000)	0.9985 (0.0000)	0.9985 (0.0000)
RATIO	0.4156 (0.0111)	0.3526 (0.0259)	0.3230 (0.0095)	0.4773 (0.1030)	0.3557 (0.0679)	0.8775 (0.1408)	1.0000 (0.0000)	1.0000 (0.0000)
LOG	0.4151 (0.0110)	0.3522 (0.0258)	0.3228 (0.0094)	0.4772 (0.1030)	0.3560 (0.0681)	0.8780 (0.1403)	1.0000 (0.0000)	1.0000 (0.0000)
DIFF	0.4661 (0.0156)	0.3748 (0.0389)	0.3043 (0.0058)	0.4245 (0.0846)	0.3776 (0.1002)	0.9399 (0.0884)	1.0000 (0.0000)	1.0000 (0.0000)
BMI								
LM	0.9872 (0.0000)	0.9872 (0.0000)	0.9870 (0.0003)	0.9721 (0.0110)	0.9868 (0.0006)	0.9872 (0.0000)	0.9872 (0.0000)	0.9872 (0.0000)
MED-RATIO	0.9961 (0.0000)	0.9954 (0.0007)	0.9910 (0.0008)	0.9756 (0.0103)	0.9944 (0.0018)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
MIN-RATIO	0.9982 (0.0001)	0.9977 (0.0005)	0.9935 (0.0012)	0.9718 (0.0145)	0.9965 (0.0023)	0.9984 (0.0000)	0.9984 (0.0000)	0.9984 (0.0000)
ABD-RATIO	0.9960 (0.0001)	0.9948 (0.0012)	0.9882 (0.0010)	0.9732 (0.0100)	0.9939 (0.0026)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
BNS-RATIO	0.9982 (0.0001)	0.9968 (0.0013)	0.9900 (0.0011)	0.9748 (0.0098)	0.9958 (0.0028)	0.9984 (0.0000)	0.9984 (0.0000)	0.9984 (0.0000)
CPR-RATIO	0.9969 (0.0001)	0.9957 (0.0013)	0.9890 (0.0011)	0.9742 (0.0096)	0.9946 (0.0026)	0.9971 (0.0000)	0.9971 (0.0000)	0.9971 (0.0000)
MED	0.9961 (0.0000)	0.9954 (0.0008)	0.9904 (0.0010)	0.9726 (0.0116)	0.9943 (0.0019)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
MIN	0.9982 (0.0001)	0.9977 (0.0005)	0.9932 (0.0013)	0.9703 (0.0151)	0.9964 (0.0023)	0.9984 (0.0000)	0.9984 (0.0000)	0.9984 (0.0000)
ABD	0.9960 (0.0001)	0.9947 (0.0013)	0.9870 (0.0014)	0.9680 (0.0121)	0.9937 (0.0028)	0.9962 (0.0000)	0.9962 (0.0000)	0.9962 (0.0000)
BNS	0.9982 (0.0001)	0.9968 (0.0014)	0.9889 (0.0014)	0.9694 (0.0120)	0.9956 (0.0029)	0.9984 (0.0000)	0.9984 (0.0000)	0.9984 (0.0000)
CPR	0.9969 (0.0001)	0.9956 (0.0013)	0.9878 (0.0014)	0.9688 (0.0119)	0.9945 (0.0028)	0.9971 (0.0000)	0.9971 (0.0000)	0.9971 (0.0000)
RATIO	0.8214 (0.0096)	0.7560 (0.0316)	0.7196 (0.0128)	0.8462 (0.0593)	0.7513 (0.0676)	0.9828 (0.0230)	1.0000 (0.0000)	1.0000 (0.0000)
LOG	0.8210 (0.0096)	0.7556 (0.0315)	0.7193 (0.0128)	0.8461 (0.0593)	0.7517 (0.0676)	0.9829 (0.0228)	1.0000 (0.0000)	1.0000 (0.0000)
DIFF	0.8592 (0.0105)	0.7788 (0.0434)	0.6923 (0.0087)	0.8111 (0.0633)	0.7669 (0.0866)	0.9929 (0.0112)	1.0000 (0.0000)	1.0000 (0.0000)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\lambda = 12$ with μ_S stressed five times per parameter category.

D.4 Jump intensity parameter: λ

Table 66 Jump detection test performances when λ is stressed under the Merton model at the 30-second sampling frequency.

	λ		
	[1, 3)	**[3, 26)**	**[26, 30]**
MCC			
LM	0.9950 (0.0004)	0.9957 (0.0007)	0.9963 (0.0004)
MED-RATIO	0.9860 (0.0037)	0.9897 (0.0022)	0.9882 (0.0006)
MIN-RATIO	0.9810 (0.0036)	0.9871 (0.0031)	0.9845 (0.0006)
ABD-RATIO	0.9770 (0.0044)	0.9849 (0.0029)	0.9824 (0.0010)
BNS-RATIO	0.9771 (0.0048)	0.9850 (0.0027)	0.9823 (0.0011)
CPR-RATIO	0.9677 (0.0070)	0.9794 (0.0048)	0.9763 (0.0009)
MED	0.7665 (0.0271)	0.9055 (0.0569)	0.9678 (0.0012)
MIN	0.7018 (0.0271)	0.8738 (0.0724)	0.9558 (0.0009)
ABD	0.6515 (0.0323)	0.8486 (0.0823)	0.9459 (0.0020)
BNS	0.6504 (0.0324)	0.8479 (0.0825)	0.9457 (0.0021)
CPR	0.5753 (0.0342)	0.8024 (0.0996)	0.9255 (0.0026)
RATIO	0.6161 (0.0294)	0.7134 (0.0381)	0.5833 (0.0125)
LOG	0.6161 (0.0294)	0.7134 (0.0381)	0.5833 (0.0125)
DIFF	0.6016 (0.0281)	0.7043 (0.0382)	0.5805 (0.0122)
BMI			
LM	0.9951 (0.0021)	0.9935 (0.0008)	0.9933 (0.0008)
MED-RATIO	0.9944 (0.0027)	0.9928 (0.0008)	0.9916 (0.0007)
MIN-RATIO	0.9940 (0.0029)	0.9920 (0.0009)	0.9903 (0.0007)
ABD-RATIO	0.9946 (0.0024)	0.9926 (0.0009)	0.9907 (0.0009)
BNS-RATIO	0.9947 (0.0025)	0.9927 (0.0010)	0.9908 (0.0009)
CPR-RATIO	0.9950 (0.0025)	0.9928 (0.0012)	0.9900 (0.0008)
MED	0.9888 (0.0027)	0.9874 (0.0009)	0.9875 (0.0007)
MIN	0.9859 (0.0028)	0.9841 (0.0011)	0.9842 (0.0008)
ABD	0.9842 (0.0022)	0.9826 (0.0010)	0.9828 (0.0008)
BNS	0.9842 (0.0023)	0.9826 (0.0011)	0.9829 (0.0008)
CPR	0.9799 (0.0022)	0.9782 (0.0013)	0.9786 (0.0007)
RATIO	0.9836 (0.0020)	0.9592 (0.0269)	0.8326 (0.0149)
LOG	0.9836 (0.0020)	0.9592 (0.0269)	0.8326 (0.0149)
DIFF	0.9828 (0.0019)	0.9578 (0.0271)	0.8306 (0.0148)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\mu_S = -0.12$ with λ stressed five times per parameter category.

Table 67 Jump detection test performances when λ is stressed under the Merton model at the 1-minute sampling frequency.

	λ		
	[1, 3)	**[3, 26)**	**[26, 30]**
MCC			
LM	0.9937 (0.0015)	0.9942 (0.0011)	0.9949 (0.0004)
MED-RATIO	0.9794 (0.0032)	0.9855 (0.0030)	0.9852 (0.0004)
MIN-RATIO	0.9749 (0.0047)	0.9835 (0.0025)	0.9822 (0.0007)
ABD-RATIO	0.9671 (0.0031)	0.9795 (0.0038)	0.9781 (0.0011)
BNS-RATIO	0.9670 (0.0031)	0.9795 (0.0038)	0.9781 (0.0010)
CPR-RATIO	0.9568 (0.0054)	0.9740 (0.0064)	0.9730 (0.0008)
MED	0.7525 (0.0261)	0.8997 (0.0593)	0.9657 (0.0012)
MIN	0.7052 (0.0324)	0.8788 (0.0687)	0.9569 (0.0018)
ABD	0.6410 (0.0317)	0.8429 (0.0855)	0.9433 (0.0031)
BNS	0.6391 (0.0320)	0.8418 (0.0862)	0.9430 (0.0032)
CPR	0.5793 (0.0334)	0.8064 (0.1002)	0.9281 (0.0034)
RATIO	0.5925 (0.0295)	0.6984 (0.0384)	0.5789 (0.0128)
LOG	0.5925 (0.0295)	0.6983 (0.0384)	0.5789 (0.0128)
DIFF	0.5651 (0.0304)	0.6822 (0.0405)	0.5736 (0.0121)
BMI			
LM	0.9933 (0.0018)	0.9906 (0.0010)	0.9904 (0.0008)
MED-RATIO	0.9931 (0.0025)	0.9908 (0.0009)	0.9895 (0.0005)
MIN-RATIO	0.9925 (0.0029)	0.9898 (0.0008)	0.9881 (0.0007)
ABD-RATIO	0.9932 (0.0033)	0.9908 (0.0009)	0.9881 (0.0007)
BNS-RATIO	0.9932 (0.0032)	0.9908 (0.0009)	0.9884 (0.0007)
CPR-RATIO	0.9937 (0.0027)	0.9910 (0.0011)	0.9881 (0.0006)
MED	0.9874 (0.0024)	0.9855 (0.0009)	0.9855 (0.0006)
MIN	0.9849 (0.0029)	0.9829 (0.0008)	0.9827 (0.0007)
ABD	0.9826 (0.0033)	0.9809 (0.0007)	0.9807 (0.0007)
BNS	0.9824 (0.0032)	0.9809 (0.0008)	0.9809 (0.0007)
CPR	0.9792 (0.0027)	0.9779 (0.0010)	0.9782 (0.0006)
RATIO	0.9809 (0.0024)	0.9552 (0.0268)	0.8288 (0.0152)
LOG	0.9809 (0.0024)	0.9552 (0.0268)	0.8288 (0.0153)
DIFF	0.9790 (0.0024)	0.9527 (0.0275)	0.8251 (0.0150)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\mu_S = -0.12$ with λ stressed five times per parameter category.

Table 68 Jump detection test performances when λ is stressed under the Merton model at the 5-minute sampling frequency.

	λ		
	[1, 3)	**[3, 26)**	**[26, 30]**
MCC			
LM	0.9863 (0.0036)	0.9874 (0.0022)	0.9880 (0.0005)
MED-RATIO	0.9257 (0.0079)	0.9612 (0.0117)	0.9700 (0.0004)
MIN-RATIO	0.9423 (0.0105)	0.9686 (0.0079)	0.9739 (0.0004)
ABD-RATIO	0.8940 (0.0137)	0.9475 (0.0177)	0.9597 (0.0004)
BNS-RATIO	0.8919 (0.0144)	0.9467 (0.0187)	0.9598 (0.0005)
CPR-RATIO	0.8747 (0.0152)	0.9376 (0.0238)	0.9553 (0.0002)
MED	0.7101 (0.0317)	0.8745 (0.0693)	0.9530 (0.0016)
MIN	0.7404 (0.0267)	0.8909 (0.0595)	0.9585 (0.0013)
ABD	0.6109 (0.0339)	0.8225 (0.0909)	0.9319 (0.0030)
BNS	0.6065 (0.0338)	0.8204 (0.0920)	0.9315 (0.0030)
CPR	0.5816 (0.0342)	0.8033 (0.0983)	0.9245 (0.0030)
RATIO	0.4688 (0.0312)	0.6226 (0.0518)	0.5672 (0.0083)
LOG	0.4687 (0.0312)	0.6226 (0.0518)	0.5671 (0.0083)
DIFF	0.4081 (0.0288)	0.5736 (0.0611)	0.5455 (0.0064)
BMI			
LM	0.9846 (0.0030)	0.9797 (0.0012)	0.9771 (0.0009)
MED-RATIO	0.9865 (0.0040)	0.9822 (0.0016)	0.9785 (0.0007)
MIN-RATIO	0.9844 (0.0042)	0.9810 (0.0014)	0.9785 (0.0006)
ABD-RATIO	0.9850 (0.0046)	0.9812 (0.0016)	0.9767 (0.0005)
BNS-RATIO	0.9850 (0.0046)	0.9818 (0.0012)	0.9781 (0.0005)
CPR-RATIO	0.9867 (0.0031)	0.9822 (0.0012)	0.9782 (0.0006)
MED	0.9802 (0.0036)	0.9766 (0.0015)	0.9753 (0.0006)
MIN	0.9789 (0.0042)	0.9760 (0.0015)	0.9754 (0.0005)
ABD	0.9742 (0.0045)	0.9717 (0.0016)	0.9709 (0.0004)
BNS	0.9740 (0.0045)	0.9721 (0.0015)	0.9721 (0.0004)
CPR	0.9745 (0.0026)	0.9715 (0.0017)	0.9716 (0.0005)
RATIO	0.9653 (0.0024)	0.9365 (0.0272)	0.8179 (0.0123)
LOG	0.9653 (0.0024)	0.9365 (0.0273)	0.8178 (0.0123)
DIFF	0.9555 (0.0026)	0.9240 (0.0295)	0.8015 (0.0117)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\mu_S = -0.12$ with λ stressed five times per parameter category.

Table 69 Jump detection test performances when λ is stressed under the Merton model at the 15-minute sampling frequency.

	λ		
	[1, 3)	**[3, 26)**	**[26, 30]**
MCC			
LM	0.9790 (0.0020)	0.9799 (0.0007)	0.9779 (0.0006)
MED-RATIO	0.8216 (0.0207)	0.9156 (0.0358)	0.9506 (0.0010)
MIN-RATIO	0.9129 (0.0074)	0.9490 (0.0163)	0.9619 (0.0016)
ABD-RATIO	0.7755 (0.0218)	0.8940 (0.0432)	0.9378 (0.0015)
BNS-RATIO	0.7691 (0.0228)	0.8921 (0.0445)	0.9377 (0.0016)
CPR-RATIO	0.7669 (0.0225)	0.8902 (0.0462)	0.9376 (0.0016)
MED	0.6686 (0.0298)	0.8502 (0.0787)	0.9392 (0.0018)
MIN	0.8072 (0.0197)	0.9089 (0.0470)	0.9559 (0.0021)
ABD	0.5852 (0.0297)	0.8029 (0.0969)	0.9194 (0.0032)
BNS	0.5767 (0.0297)	0.7990 (0.0989)	0.9188 (0.0034)
CPR	0.5790 (0.0299)	0.7995 (0.0987)	0.9190 (0.0034)
RATIO	0.3393 (0.0268)	0.5235 (0.0748)	0.5627 (0.0028)
LOG	0.3393 (0.0268)	0.5234 (0.0748)	0.5625 (0.0028)
DIFF	0.2772 (0.0234)	0.4545 (0.0772)	0.5140 (0.0019)
BMI			
LM	0.9714 (0.0063)	0.9655 (0.0028)	0.9577 (0.0014)
MED-RATIO	0.9747 (0.0052)	0.9691 (0.0041)	0.9606 (0.0009)
MIN-RATIO	0.9654 (0.0091)	0.9601 (0.0034)	0.9539 (0.0018)
ABD-RATIO	0.9714 (0.0079)	0.9667 (0.0037)	0.9589 (0.0009)
BNS-RATIO	0.9716 (0.0078)	0.9683 (0.0032)	0.9617 (0.0008)
CPR-RATIO	0.9724 (0.0073)	0.9679 (0.0034)	0.9607 (0.0008)
MED	0.9695 (0.0051)	0.9644 (0.0033)	0.9586 (0.0007)
MIN	0.9631 (0.0088)	0.9578 (0.0030)	0.9531 (0.0019)
ABD	0.9628 (0.0078)	0.9590 (0.0025)	0.9552 (0.0007)
BNS	0.9625 (0.0077)	0.9604 (0.0021)	0.9579 (0.0007)
CPR	0.9636 (0.0073)	0.9601 (0.0021)	0.9570 (0.0007)
RATIO	0.9315 (0.0046)	0.9033 (0.0265)	0.8110 (0.0073)
LOG	0.9314 (0.0046)	0.9032 (0.0266)	0.8108 (0.0073)
DIFF	0.9060 (0.0047)	0.8730 (0.0302)	0.7726 (0.0073)

Average and standard deviation (in parenthesis) of the MCC and BMI performances of the jump detection tests. Data simulated using 1 000 replications and constant parameter values of $S_0 = 100$, $r = 0.1$, $\sigma_V = 0.09$, $\sigma_S = 0.15$ and $\mu_S = -0.12$ with λ stressed five times per parameter category.