

Effectiveness Of Using Refresh Rates in MQL4 Programs

Understanding how and when your MQL4 Expert Advisor (EA) or indicator code executes is crucial for its effectiveness, performance, and reliability. The concept often referred to as "refresh rate" boils down to choosing the right event handler – primarily OnTick() triggered by price changes, or OnTimer() triggered by set time intervals. Each approach has significant implications.

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Recommendations & Guidance (Synthesis)

There's no single "best" refresh strategy in MQL4; the optimal choice depends on the specific requirements of the EA or indicator, involving trade-offs between responsiveness, reliability, and performance.

- **Use OnTick() when:**
 - **Maximum responsiveness** to price changes on the *current symbol* is the top priority.¹
 - The code within OnTick() is **highly optimized and executes very quickly** (essential to minimize the chance of missing subsequent ticks).²

- The core logic is primarily driven by **price action on a single symbol**.¹
- *Potential Downsides*: Frequency depends entirely on market activity ¹; **missed ticks are possible** if execution is slow ¹; can cause high CPU load with complex code or during high volatility ⁷; potential bottlenecks if many EAs trigger simultaneously.⁴
- **Use OnTimer() when:**
 - Actions must occur at **specific time intervals**, regardless of tick activity (e.g., end-of-day processes, periodic analysis, session checks).¹
 - Managing **multi-currency EAs** where checking multiple symbols at consistent intervals is needed (as ticks across symbols are asynchronous).¹⁰
 - **CPU load needs to be managed** by executing less frequently than every tick, and tick-level precision isn't the main requirement.¹¹
 - There's a risk of OnTick() execution taking **too long and being terminated** by the MT4 terminal.¹²
 - *Potential Downsides*: Introduces **latency** (acting on potentially slightly older data) ¹³; **reliability issues** (stopping/lagging) have been reported, particularly in MT4 ³; the **minimum effective interval is limited** (~16ms), not true millisecond precision.¹⁴ Test thoroughly, as OnTick might be more stable in some environments.³
- **Hybrid Approaches**: These are common and often effective. Use OnTick() for fast, essential price-sensitive checks, and OnTimer() for less frequent tasks, multi-symbol management, time-based logic, or as a stability backup.¹¹ Checking for new bars (e.g., comparing Time to a stored value) within either

handler is standard practice for strategies trading on bar open/close.¹⁶

Conclusion

Neither OnTick() nor OnTimer() is inherently superior. Developers must weigh the pros and cons based on their specific goals. OnTick() offers immediacy but risks missed ticks and performance issues if not carefully managed.¹ OnTimer() provides predictable timing but introduces latency and has potential reliability concerns and resolution limitations.³ Regardless of the choice, **efficient coding is paramount** to ensure the EA or indicator functions correctly and reliably without unduly stressing system resources.⁷

Detailed Findings:

1. 'Refresh Rate' Definition:

- "Refresh rate" is not a formal MQL4 term but generally refers to the frequency at which an EA or indicator executes its main logic.¹⁹
- This frequency is primarily determined by the event handlers used: OnTick() (driven by incoming price ticks) or OnTimer() (driven by a set time interval).¹
- The RefreshRates() function is a distinct tool used *within* code execution (often EAs or scripts) to specifically update cached data like pre-defined variables (Ask, Bid, Close, etc.) and series arrays for the *current chart's symbol*.²⁰ It's typically used after long calculations or Sleep() calls and does not control the primary execution frequency.²⁰

2. Event Handlers:

- OnTick(): This function is called **only in Expert Advisors** whenever a new price tick (a change in Bid or Ask price) arrives for the symbol the EA is attached to.¹
- OnTimer(): This function can be used in **both EAs and indicators**. It's called periodically based on a timer interval set by the programmer using EventSetTimer() (in seconds) or EventSetMillisecondTimer() (in milliseconds).¹
- OnCalculate(): This is the primary execution function for **custom indicators**, triggered by price data changes.¹ It behaves similarly to OnTick in being price-driven but is specific to indicators.²
- Other handlers like OnInit(), OnDeinit(), and OnStart() manage program initialization, deinitialization, and script execution, respectively.¹

3. OnTick() Execution Frequency:

- The frequency of OnTick() calls is entirely dependent on the **market activity** for the specific symbol.²⁴ During high volatility, it executes frequently; during low volatility or outside market hours, it executes infrequently or not at all.²⁴
- **Crucially, MQL4 does not guarantee that OnTick() will execute for every single tick. If the code inside OnTick() is still running when a new tick arrives, that new tick event is ignored by the terminal for that EA.**¹

4. OnTimer() as an Alternative:

- OnTimer() provides a way to execute code at **predictable intervals**, independent of tick frequency.¹
- The interval is set using EventSetTimer(seconds) or EventSetMillisecondTimer(milliseconds).¹
- It's recommended to initialize the timer in OnInit() using EventSetTimer() and stop it in OnDeinit() using EventKillTimer().¹

- Only **one timer** can be active per EA or indicator.¹
- Similar to OnTick, if OnTimer() execution takes longer than the set interval, subsequent timer events might be skipped or delayed.¹

5. Performance Impact:

- Executing complex calculations or handling many indicators/EAs within OnTick() can lead to **high CPU usage**, especially during volatile periods when ticks are frequent.⁷ This can slow down or even freeze the MetaTrader terminal.⁷
- Inefficiently coded programs (e.g., recalculating unchanged historical data on every tick) are major contributors to performance problems.⁷
- The MT4 terminal might **terminate OnTick() execution** if it runs for too long, potentially disrupting the EA's logic.¹²
- Using OnTimer() with a reasonable interval (e.g., 1 second or more) can significantly reduce CPU load compared to processing every tick, but introduces latency and has its own potential reliability issues.¹¹

6. Responsiveness vs. Accuracy:

- OnTick() offers the **highest potential responsiveness** to immediate price changes, assuming its code runs fast enough to avoid missing ticks.¹
- OnTimer() inherently introduces **latency**, as the market state is only checked at fixed intervals.¹³ Actions might be based on slightly stale data compared to an ideally functioning OnTick() handler.¹³
- The impact on "accuracy" depends on the strategy. Scalping strategies might suffer significantly from OnTimer latency or missed OnTick events.²⁶ Strategies based on closed bars might

be less sensitive.¹⁶

- OnTimer is essential for **time-based accuracy** (e.g., executing an action precisely at the start of a new hour) where tick arrival times are irrelevant or unreliable.³

7. Limitations:

- **Missed Ticks (OnTick):** It's confirmed that OnTick() execution is **not guaranteed for every tick**.¹ Slow code execution will lead to missed ticks.²
- **Timer Reliability (OnTimer):** User experiences, particularly with MT4, indicate that OnTimer() can sometimes become unreliable, **stopping or lagging significantly**.³ This might be related to system load or internal timing mechanisms.³ Thorough testing in the target environment is crucial.³
- **Timer Resolution (OnTimer):** While EventSetMillisecondTimer() exists, the practical minimum timer interval achievable seems limited by the system's underlying timer resolution, reported by users to be around **10-16 milliseconds**, not true 1ms precision.¹⁴ Achieving highly precise (sub-second) timing for order execution via OnTimer is also difficult due to network latency and server processing time.¹³

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